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OFFICIAL PROCEEDINGS

OF THE

Twelfth Annual Convention

Master Boiler Makers' Association

1920

Master Boiler Makers Association

OFFICIAL PROCEEDINGS

OF THE

Twelfth Annual Convention

HELD AT

HOTEL CURTIS
MINNEAPOLIS, MINN.

May 25th, 26th, 27th and 28th, 1920

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CONTENTS

	PAGE
Officers for 1920-1921	5
Subjects and Committees for 1921 Convention	6
Memorial page	7
List of Past Presidents	8
Members attending convention of 1920	9
Guests at convention	12
Address of Mayor J. E. Meyers of Minneapolis	12
Response of Mr. J. T. Goodwin	14
Address of Mr. William Schlafge	15
Response of Mr. J. P. Conrath	21
Address of President John B. Tate	22
Annual Report of the Secretary	23
Membership Record	24
Annual Report of the Treasurer	25
Illustrated Lecture by Mr. John M. Hall of Washington, D. C.	36
Address of Mr. W. H. Bremner	40
Explanation from the Supply Men	42
Report of Committee on Best Type of Washout Plug	44
Report of Committee on Topic No. 2	52
Report of Committee on Topic No. 3	55
Report of Committee on Topic No. 4	62
Report of Committee on Topic No. 5	64
Address of Mr. A. R. Kipp	67
Address of Prof. Alfred S. Kinsey of Stevens Institute of Technology	69
Paper on "Electric Welding" by Mr. Charles L. Hempel	76
Report of Committee on Topics for 1921 Convention	94
Grates for Bituminous Coal, etc.	96
Report of Committee on Law	102
Report of Committee on Resolutions	103
Election of Officers	104
Acknowledgments of the Successful Candidates	105
Report and Recommendations of Executive Board	107
Presentation to Past President Tate	112
New Members Enrolled	115
Constitution and By-Laws	117
Membership list	124
The Women's Auxiliary	147

OFFICERS FOR 1920-1921

President
CHARLES P. PATRICK
1442 McCormick Bldg., Chicago, Ill.

First Vice-President
THOMAS LEWIS
G. B. I., L. V. R. R., Sayre, Pa.

Second Vice-President
T. P. MADDEN
G. B. I., M. P. R. R., 6947 Clayton Ave., St. Louis, Mo.

Third Vice-President
E. W. YOUNG
G. B. I., C. M. & St. P. R. R., 81 Caledonia Pl., Dubuque, Ia.

Fourth Vice-President
FRANK GRAY
G. F. B. M., C. & A. R. R., 705 W. Mulberry St., Bloomington, Ill.

Fifth Vice-President
THOMAS F. POWERS
System G. F., Boiler Dept., C. & N. W. R. R.,
1129 So. Clarence Ave., Oak Park, Ill.

Secretary
HARRY D. VOUGHT
95 Liberty St., New York City

Treasurer
W. H. LAUGHRIDGE
G. F. B. M., Hocking Valley R. R., 537 Linwood Ave., Columbus, O.

Executive Board
JOHN F. RAPS, Chairman
EDWARD J. REARDON, Secretary

One Year
L. M. STEWART
F. B. M., Atlantic Coast Line, Waycross, Ga.
JOHN F. RAPS
G. B. I., I. C. R. R., 4041 Ellis Ave., Chicago, Ill.
JOHN HARTHILL
G. F. B. M., N. Y. C. R. R., 1101 E. 145th St., N. E., Cleveland, O.

Two Years
W. J. MURPHY
G. F. B. M., Eastern Region, Penn. System, Allegheny, Pa.
HARRY F. WELDIN
F. B. M., P. R. R., 3026 N. 15th St., Philadelphia, Pa.
E. J. REARDON
Dist. Insp., Loco. Boilers, I. C. C., 7112 Euclid Ave., Chicago, Ill.

Three Years
B. F. SARVER
F. B. M., Penn. Lines West, 234 E. Woodlawn Ave., Ft. Wayne, Ind.
HENRY J. WANDBERG
Trav. B. I., C. M. & St. P. R. R., Milwaukee, Wis.
GEORGE AUSTIN
G. B. I., A. T. & S. F. R. R., 6 Devon Apartment, Topeka, Kans.

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SUBJECTS AND COMMITTEES FOR 1921 CONVENTION

(Subject to Future Changes)

1. "Describe Present and Best Method of Welding Safe Ends on Locomotive Tubes; Iron End to Iron Body; Steel End to Iron Body; Steel End to Steel Body; Shape and Length of Scarf and Flux if Used; Results Obtained by Applying Safe Ends Without Scarfing; Degree of Heat Necessary to Obtain Best Results in Welding, and Advisability of Having a Pyrometer on Welding Furnace."—P. J. Conrath, Chairman; J. A. Doarnberger, Alfred F. Stiglmeier.

2. "Are the Advantages and Merits of the Hot Water Boiler Washing System of Greater Benefit Than the Disadvantages? Describe System Used and What Benefit is Derived Therefrom."—Edward Cantwell, Chairman; W. J. Murphy, F. P. Roesch.

3. "Which is the Better Crown Stay for the Different Classes of Locomotives; the Stay Screwed into the Crown Sheet with the Taper and Riveted Over, or the Button Head Crown Stay?"—Lewis Nicholas, Jr., Chairman; Thos. F. Powers, J. J. Mansfield.

4. "How Can the Deterioration of Firebox Sheets Behind Grate Bars and Supports be Eliminated?"—C. E. Elkins, Chairman; C. F. Petzinger, John J. Orr.

5. "What is the Cause of the Boiler Shell Cracking Through Girth Seam Rivet Holes? Is there any way in which this can be Overcome or the Time of Rupture Prolonged?"—Andrew S. Greene, Chairman; Wm. A. McKeown, T. W. Lowe.

6. "What is the Best Type of Side Sheets to be Applied to Narrow and Wide Firebox Locomotives; Depressed, Corrugated, Vertical, or Longitudinal or Straight?"—C. R. Bennett, Chairman; William F. Fantom, J. P. Malley.

7. "What is the Most Economical Method of Repairing Cracked Mud Rings or Corners Without Removing the Mud Ring?"—Harry F. Weldin, Chairman; T. J. Reddy, J. E. Cooke.

8. "Oxy-Acetylene Welding."—D. A. Lucas, Chairman; H. J. Wandberg, Thomas Lewis.

9. "Electric Welding."—H. H. Service, Chairman; I. J. Pool, R. W. Clark.

10. Law.—George W. Bennett, Chairman; A. N. Lucas, John Wintersteen.

11. "What are the Advantages and Disadvantages of Treated Boiler Feed Water?"—T. P. Madden, Chairman; George Austin, E. W. Young.

12. Topics for 1922 Convention.—J. W. Kelly, Chairman; John B. Tate, Thomas Lewis.

Special committee of five to investigate Autogenous Welding: Thos. F. Powers, Chairman; John F. Raps, John Harthill, C. E. Elkins, H. J. Wandberg; W. J. Murphy.

In Memoriam

FRANK BANNAN
Died December, 1918.

C. E. FOURNESS
Died February 1, 1920.

WILLIAM KRUM
Died March 8, 1920.

BENJAMIN F. SARVER
Died July 23, 1920.

PAST PRESIDENTS

(Before Consolidation)

Thomas C. Best	1902–1904	Deceased
John H. Smythe	1904–1905	
W. M. Wilson	1905–1906	
F. J. Graves	1902	Deceased
J. A. Doarnberger	1903	
W. H. Laughridge	1904	
J. T. Goodwin	1905	
C. L. Hempel	1906	

(After Consolidation)

George Wagstaff	1907–1908
P. J. Conrath	1908–1909
A. E. Brown	1909–1910
A. N. Lucas	1910–1911
G. W. Bennett	1911–1912
M. O'Connor	1912–1913
T. W. Lowe	1913–1914
J. T. Johnston	1914–1915
Andrew S. Greene	1915–1916
Daniel A. Lucas	1916–1919
John B. Tate	1919–1920

PROCEEDINGS OF THE TWELFTH ANNUAL CONVENTION

FIRST SESSION

The Twelfth Annual Convention of the Master Boiler Makers' Association convened at the appointed hour, May 25th, 1920, at the Hotel Curtis, Minneapolis, Minn., with the President, Mr. John B. Tate, in the chair. Members and guests who registered were:

Aiken, C. H.
Akins, A. A.
Albert, Jacob
Albrecht, J. A.
Anderson, Andrew
Ashback, Joseph O.
Austin, George
Baird, A. M.
Barnes, W. R.
Batchman, F. A.
Baumann, C. J.
Bayer, Fred
Beland, Arthur J.
Bennett, G. W.
Bieser, C. J.
Billington, Matthew
Blaney, R. J.
Bono, Calvin M.
Borneman, L.
Bove, James
Brandt, John A.
Brennan, John
Browning, C. H.
Browning, Percy
Burdett, Thomas E.
Burgan, E. R.
Burno, L. J.
Burnside, R.
Cahill, Jeremiah
Campbell, John C.
Chastain, J. H.
Christianson, J.
Clark, R. W.
Clas, John A.
Codden, John C.
Conrath, P. J.
Conroy, Robert L.
Cook, E. C.
Cook, Walter
Cooke, J. E.
Corns, Charles C.
Cosgrove, P. E.
Courtney, M. S.
Creger, R. A.
Crimmins, R. P.
Crites, John O.
Crombie, James
Daly, James
Davey, J. J.
Davison, Frank
Denzler, H.
Derrig, Peter
Dittrich, A. C.
Donahue, Thomas P.
Doolin, Richard
Douglass, Charles H.
Downs, James L.
Eberle, Lewis
Eder, Jeremiah
Egan, P. J.
Elkins, C. E.
Erickson, M. B.

Evans, W. H.
Fantom, William F.
Feld, John B.
Fennelly, M. J.
Fisher, George G.
Fitzsimmons, E. S.
Fogerty, Kearn E.
Follin, E. F.
France, Myron C.
George, W. F.
Gibler, Peter J.
Giddings, Archibald
Gill, K. K.
Goodwin, James T.
Gorman, John T.
Grant, Charles W.
Green, T. P.
Greene, Andrew S.
Guiry, M. J.
Gunn, James G.
Hogan, Charles E.
Hagan, George N.
Hanna, Robert J.
Harper, Carl A.
Hasse, F. C.
Healy, M. E.
Hedberg, Andrew
Heidel, Edward H.
Heiner, C. W.
Hempel, C. L.
Hidde, John E.
Hiett, P. J.
Hilliger, Ernest E.
Hogan, William A.
Holder, J. A.
Housley, J. P.
Howe, Frederick J.
Hucabee, William
Hunt, Edward
Hursh, P. S.
Hutchinson, George B.
Janes, R. W.
Jenkins, F. J.
Jennings, Gilmore
Johnston, Jas. T.
Jones, G. J.
Keefe, J. C.
Keidel, William F.
Kelly, J. W.
Kilcoyne, Thomas F.
King, B. C.
Kingsley, J. C.
Kinninger, William
Kissinger, Frank H.
Klink, Charles M.
Knauer, F. W.
Koebernik, O. H.
Kraus, Charles
Kreider, Charles N.
Kremer, John
Lacerda, Harry A.
Ladtkow, O. F.
Larason, W. S.
Laughridge, William H.
Laysek, James
Laysek, Theodore
Lenz, A. C.
Lewis, Thomas
Libera, Jos. R.
Litz, Franklin T.
Longacre, Charles J.
Lucas, A. N.
Lucas, D. A.
Lucas, W. H.
Lux, Peter
McCallister, M. M.
McCloskey, Joseph
McDermott, John
McGarrigal, John
McHugh, L. P.
McKenna, John F.
McKeown, John
McMonagle, S. A.
McNamara, J. W.
Mackeroth, W.
Madden, J. J.
Madden, T. P.
Maher, E. J.
Mahoney, John J.
Mansfield, John J.
Marshall, R. L.
Martin, Nicholas W.
May, S. C.
Medinger, M. L.
Minehan, James H.
Mitchell, Lee A.

Moses, L. O.
Murphy, Martin
Murphy, W. J.
Neary, John T.
Nelson, H. B.
Nicholas, Lewis, Jr.
Nicholson, E. J.
Norton, William
Novak, Albert W.
O'Laughlin, Thomas J.
Orr, John J.
Osborn, J. D.
Pable, Charles
Patrick, Charles P.
Peabody, R. T.
Petzinger, C. F.
Pollock, William
Pool, I. J.
Pool, L. J.
Porter, Louis R.
Potts, David W.
Powers, John P.
Powers, Thos. F.
Rahrle, Frank J.
Ralston, J. N.
Raps, John F.
Reardon, Edward J.
Rearick, G. M.
Reddy, T. J.
Redmond, A. J.
Renno, Paul C.
Riley, George N.
Robertson, G. S.
Robinson, G. P.
Roehrig, Louis
Rogers, E. W.
Rushton, Horace
Russell, Robert
Ryan, Clement
Ryder, Corbet A.
Sadler, T. N.
Sampson, F. C.
Sarver, B. F.
Scholl, H. J.
Seaburg, A.
Seaburg, Nels
Service, John
Service, H. H.
Shaffer, C. W.
Shaule, A. E.
Sherbert, George M.
Simms, Edw. G.
Simons, W. J.
Smith, F.
Smith, James P.
Stark, Daniel A.
Steeves, L. W.
Steinbuck, M. L.
Stigmeier, Albert F.
Stillwell, E. E.
Strinsky, William
Sullivan, F. J.
Sullivan, Joseph
Swarmer, C. C.
Sweeney, E. J.
Talbott, T. J.
Tate, John B.
Tate, M. K.
Thompson, Peter
Todtz, Frederick
Tracy, U. R.
Troutman, G. A.
Tulin, Tad P.
Umlauf, E. C.
Usherwood, George B.
Voss, Otto C.
Wagstaff, George
Walla, Frank
Wandberg, H. J.
Ward, Charles
Warner, Victor
Washburn, Leon E.
Welk, John L.
Whalen, Benj. F.
Whalen, Charles P.
Whitman, C. L.
Wick, John
Wilson, Frank E.
Wilson, J. T.
Witting, F. N.
Yochem, Frank
Young, C. F.
Young, E. W.
Young, George L.
Young, Reynold C.
Zeigenbein, Emil
Zureick, John R.

GUESTS OF THE ASSOCIATION

Coleman, Charles, M. M., C. M. & St. P. R. R., 701 W. Broadway, Winona, Minn.
Hall, J. M., Asst. Chief Insp. of Locomotives, I. C. C., Washington, D. C.
Riley, J. L., C. M. & St. P. R. R., Sioux City, Ia.

The opening exercises began with the singing of "America" and the Rev. George L. Morrill, pastor of the People's Church of Minneapolis, then made an impressive invocation.

The President then introduced the Hon. J. E. Meyers, Mayor of Minneapolis, who welcomed those present as follows:

ADDRESS OF WELCOME BY MAYOR J. E. MEYERS.

Mr. President, Ladies and Gentlemen:

I will confess to a surprise, not so much at your being with us, because we anticipated that, but on the large assemblage that I am finding here; also on the fact that this is one of the few gatherings that I have talked to—not being an orator I do not make addresses—during the last year and a half, who were promptly on time at their convention.

The Mayor of Minneapolis this morning presided at a board meeting at 8.30—the Welfare Board. That meeting held until 9.30 o'clock. He has since interviewed the newspaper men. He has had two committee meetings. He was preparing his proclamation for Memorial Day, when the secretary came in and said, "They are waiting for you." I said, "Well, if they are like the usual convention —." Mr. Chairman, I frequently have the chairman present with the secretary and one or two others, and the others come drifting in, because they expect merely an ordinary perfunctory greeting—and lo! and behold! I am greeted from the outside at once, and I see a gathering of this kind. You have given me a most wholesome surprise. I wish that all conventions were as prompt, and that your work may always be begun as promptly as this convention has been—that when the contract is made, the completion of that work may be 10 minutes ahead of time instead of a minute after.

Now, I am not going to talk shop. I could not if I would, except that some of you here have been very kind in keeping me among that class of people who might have some chance of getting to heaven because of not having too much wealth.

I understand this is the first meeting you have had in Minneapolis. I hope your stay will be such that you will want to repeat it at an early date. The matter of the chief executive of a city giving you a welcome has come to us as more of a form, and so many conventions consider it as a mere form. To my mind it appears frequently as I come before the various people who meet with us here as a good deal of—"well, I have got to listen to it—and I would like to see anyhow what kind of an animal this mayor is; see whether he is any different from the fellows we saw before!" (Laughter and applause.)

I see many of you concur with me in that view. I have been there with it myself at conventions all over the country, and have said, "For heaven's sake, must we hear the governor and the mayor and a few other fellows practicing on us, perhaps for their campaign next year?"

But I am not now practicing for a campaign, as the people of Minneapolis especially know; because this mayor is not open for campaigns in the future. (Laughter.)

But friends, it does give me pleasure to see this splendid gathering with us. Those of you who have been here before know that you need no welcome—you know you are welcome.

In these days of democracy we don't have walls about our cities to give away actual keys to somebody to hold for a while that they may come in and go out; but the streets are wide open, inviting you in. The lines of demarkation between country and city are barely defined throughout the United States, so that when you enter into or cross the limits of a city, you are hardly aware of it. And you know also as a rule, at least, as a man who has visited other conventions and cities, I have known that so long as I have the cash to buy the wherewithal, I am always welcome. The trouble comes when I am without it. (Laughter.) And the question always arises with me, how much am I going to get for the dollar I am going to blow in?

We have with us a class of people, just as well as you have where you come from, who will do their best to see how little they can give you for what they can get. (Laughter.) The only belief we harbor, is that we have less of them than you have at your own home. (Laughter.) On the other hand, we have some with us who are anxious to give you all the service possible for the dollars and the money that you expend. We have them all over the country, thank God, and they are salt to the leaven—a whole meal if possible.

And friends, I can only say in regard to these conventions, that I think they have been a God-send to this country in the past, and will be in the future, bringing different sections of the country together, and causing us to realize that competition is a good thing.

Of course, we are the only fellows that try to play square; and the other fellows take an advantage! That is the doctrine of *caveat emptor*—"Let the buyer beware!" And also the difference of class distinction—the "has" and the "has not;" and the other fellow trying to get what that one has. Now that is not American democracy; and it does not win out in the long run.

In these times above all others, when we can get together, not only along certain lines of trade, but when we can get together and meet with those of other trades in our other lines of conventions and gatherings, the fraternal and others of that kind, we help to cement ourselves closer and closer, one section of the country with another, one type of people with another, one group with another, so that it does not become merely a question of class distinction and one class hating another class; but one class recognizing in another class similar human beings, with the same likes and dislikes and desires, and realizing that we are all aiming at one thing, and that is the benefit of our country under the dear old flag that has flown over us so long! (Applause.)

You and I, in our respective communities, serve our country not only if we do our duty well, but also if we get into touch and conjunction with others as citizens of our commonwealth and say "let's work together," not with the spirit of everybody for himself and the devil take the hindmost; not even with the spirit of live and let live; but let's take the spirit of live and help to live—a better doctrine! It will work out right; and probably if you have any hopes of enjoying a cool place instead of a warm place hereafter, it may help you there. There are some who have been paying the bills that don't think a steam fitter will get up there! (Laughter.)

But it will help to have co-operation in this country. We are going through a crisis—you know it yourselves—the same as in '65; the same as is always gone through when the government naturally, whether it be a democracy or an autocracy, becomes extravagant in war time and then tries to readjust itself. And well for him who can readjust himself early and aim to get back, not, probably, to former conditions, but at least to former principles of living; all serving to the best of our interests, and that means the common interests because if the fellow across the street, my neighbor, doesn't prosper, the chances are I won't. I will want to get out of that neighborhood. And God help him if he becomes an employer. It should be his aim, and my aim, and it is, I believe, the aim of some men, to see that everyone is contented and has the means of living in this country happily; and not only himself but also those associated with and related to him.

Let us remember that we are one great common family, and while you are in Minneapolis make yourself at home so that we won't know the difference between you and Minneapolitans. If I had a visitor in my house I should hate to have him sit in a corner by himself. So be sociable while you are here. Don't expect everybody to fall over themselves looking out for you, but if wrong comes, bring it to our attention and we will try to make it right if we can, because we want you to go away contented so that you will come back again.

And one more thing we have; and we are not entitled to all the credit, friends. Don't go back and knock your own city after you find your own city is not as beautiful as Minneapolis. (Laughter.) Stand by your own town! (Applause.) Don't make your friends and relatives discontented. And you ladies, don't nag the old man, for heaven's sake, and say, "Let's move up to Minneapolis!" Our housing conditions are just as bad as yours; probably a little worse. Any city that is healthful and beautiful, (and we are only beautiful if we have decent people living here—so you see we take a little credit to ourselves) is going to have these housing conditions. So if you come, make arrangements ahead. (It is find camping out in the winter!) (Laughter.) I know that you have tried it.

Now friends, stay as long as you can. At least until you are nearly broke. Have enough money to get out. If possible you ought to visit the lakes of our state. You will make a mistake if you do not give them at least a visit; not to make you discontented, but just so you will know where to go to get a change for a month, or even a week. Come up to see, not the 10,000, but the 13,000 lakes in the State of Minnesota. Those of you who have good warm blood in your veins (and you look like men who have it), besides a little cash in your pockets, why do a little fishing and hunting.

And we make an effort in this city through the mayor's office to get reports from the mayors of the cities around about us, because in this state the mayors are organized into a state union through which we are trying to co-operate with each other in order to give the best service to those who come to us that can possibly be given. We are not expecting the millenium in a year, or in 10 years; but we are driving towards it and want it as soon as we can get to it, which I am afraid will not be in our time: at least I don't want it to be here yet. But I want improvement right along.

Friends, we know you are welcome. I bid you all God-speed, but will be glad to see you come back again. If you get into trouble and are entitled to a good sentence, we will put you in the workhouse. The population has been so reduced out there that I tell you it has been hard on us: but most of you look as though you could do a good day's work. We will make you do it. (Laughter.) But I am satisfied we will have little complaint since we are watching things pretty close. (There is some stuff here.) (Laughter and applause.) But we want to send you men, not your wives, to serve time. But we won't do it without it being reported by somebody that you raised—in the revised version, *hades*—while you were here! (Applause.)

Response of Mr. J. T. Goodwin.

Mr. Mayor, Mr. President, and Ladies and Members of the Master Boiler Makers' Association:

I don't know how I can make an appropriate response to this eloquent address of the Mayor of Minneapolis. I know that he is really one of the happiest men I ever saw before a convention of any kind. He is pleasing; he tells you of all the beauties of the city, and how welcome you are; and I am sure you echo my sentiments when I say that you are glad to come here this morning and accept the hospitalities of this wonderful city.

The Mayor tells you how prompt you were in assembling. We quite well see this, and remind him of the fact, that if we were not on time we would not have the boilers of today; we would not have the power of today. It is the intention of this Association at all times to hew to the minute and keep on time, Mr. Mayor.

I was just reminded in going over this history of Minneapolis of a little story I once heard, and possibly the Mayor could explain it. Owing to the great rivalry between Minneapolis and St. Paul, the two school boards of these cities had a joint meeting. The object was to adopt the Bible in the public schools. One member from Minneapolis was absent, and through courtesy to him they did not think it would be proper to take a final vote until all members could be present. So the meeting was accordingly deferred. The absent member was a Swede. When advised of the object of the meeting he replied, "Me never reed this book; but me git this book and me reed it before next meeting." When the next meeting was called he asked the privilege of the floor and said he understood the object of the meeting, and added: "Me wish to say me git this book and me reed him through. This book say St. Paul, St. Paul all the time but never say Minneapolis once. Me cannot vote for this resolution." (Laughter.)

So with it all we hope to be with the Mayor and give the people of this vicinity quite a lot of pleasure; and our people will not take any more than they can get (laughter); but if you have anything that really looks good, we will be glad to get it.

Now Mr. Mayor, we thank you very much for coming here this morning; and this convention is very proud of your opening address.

Mr. William Schlafge of New York City, Mechanical Manager of the Erie Railroad, was next introduced and addressed the convention as follows:

ADDRESS OF MR. WILLIAM SCHLAFGE.

Mr. President, Ladies and Gentlemen:

I notice that your esteemed President had difficulty in pronouncing my name. I will pronounce it for you so you will get me right. I am not blaming the President because I find many people have to whistle before they can pronounce it. I am not making any apologies for the name. I was there when I got it but was not responsible. (Laughter.)

At the Front End of an address it is well to know that there is a Safe End in sight. I think it is wise, therefore, to assure you that nothing said will carry any personal reflection. Speaking of personalities reminds me that up in this neck of the woods they used to tell a story about a crooked poker player. Poker I will explain for the benefit of those who never heard of it, was a game played in the good old days. As it has been explained to me, it was played with bits of pasteboard of uniform size on which were printed various colored characters. The bits of pasteboard called "cards" each had a certain value, especially in combination with other "cards." The game consisted in guessing what combination of cards the other players held. Interest was added to the game by hazarding coins or other things of value on one's ability as a guesser.

This game of poker was very popular in the North West, though I suppose it is a lost art here now. Anyway this crooked player who had but one eye was caught cheating. Thereupon one of the players said he hoped no one would think he was getting personal, but if the fellow who just tried to palm an ace did it again he would shoot his other eye out.

No matter what one's inclination may be, these days of hard water and extra dry steam tend to put a damper on free speech especially, as in my case, if one has not had time to get real chummy with the Mayor and Chief of Police. No matter how much time has been spent bottling up for the occasion, even though the pressure threaten to blast the patches off the barrel course, the blow-off must still be used with caution. Let us hope, however, that with everything bottle tight, the bar stays well secured and all parts, fittings and appurtenances certified "safe and serviceable," we may be allowed to pack along in peace, in consideration of the notorious fact that we are all pledged to the cold water test.

The prime object of your Association is to improve the art and promote the science of boiler design construction and maintenance to the end that boilers may be built better and safer, and at the same time steadily work toward the highest attainability in economical operation. You seek to reach this and the other objects of your organization in part by interchange of ideas in these conventions of master craftsmen, and by drawing on the rich mines of your united experience in committee work and in your discussions. In furthering these worthy aims, you serve well the true industrial interests of the country.

As a craft, boiler makers are held to be a noisy lot. They are, and it is no reproach to say it. Boiler making in truth is about the noisiest of trades. The clatter and banging of the boiler shop has passed into proverb. But while the craft makes lots of noise, it makes it with its hands. Industry is a machine that gives its best response when operated by sympathetic hands directed by trained intelligence.

There was an interesting but spiteful story current in the early days of the war calculated as a sly attack on a class of very upright and deserving men. The Government, it appears, was obliged by circumstances to use some ships not equipped with wireless. Thereupon some men spirited cuss suggested putting a few leather lunged old time foremen boiler makers aboard each ship, which lacked such equipment, to send out S. O. S. calls in case of danger. We know, of course, that there could be no truth in such a story and that it could originate only in an envious mind.

Having now shown how much I think of you individually and collectively, and having I hope established friendly relations, I will, in the same old way of all guests, trespass upon your hospitality for a short time with some remarks which will ramble into advice, prophecy, encouragement and other things.

Your Association fills a very definite place in the industrial life of this country. You have done much constructive and valuable work along the lines covered by the scope of your organization. You know your business and out of your practical experience and technical knowledge, you have left your impress upon the line of work in which you are engaged. You deserve and surely have the best wishes of all users of boilers for still greater achievements and continued success in building up the Association.

But while you have a duty to this Association, you have in common with all the rest of us a higher duty to our country and its general welfare. I feel, therefore, if it is in my power to say anything that will make that duty clearer and, in the least, inspire any one of you to a keener appreciation of it, that there is no way in which I can take your time to better advantage.

A large number of people are moralizing about present day conditions and hopefully waiting for something to happen, another large group spends its time in prescribing remedies and confusing people by applying big names to very common things.

These groups, in the main, do little to help the situation and there are others who devote too much time to trivial matters and neglect the big things that count. This is no time to watch the pennies and overlook the dollars. Too many fail to see the real point in a situation.

This is well illustrated by a story that I will relate: A mother and her small son were standing on a corner waiting for a street car. They had waited a long time and the boy especially was getting impatient. Finally he saw the car coming and remarked with great emphasis, "Mother, there comes that —— —— car now!" His mother reproved him by saying, "Son, how often have I told you that it is bad manners to point?" (Laughter.)

From the viewpoint of history, the unusual conditions prevailing today are not essentially different from those that have followed a similar series of events, that have produced the present situation, all through history. There is not much wrong with the world today except that a large portion of its inhabitants have quit working either wholly or in part, and have got the deluded notion that somehow they are going to be able to exist without working in utter disregard of the wise words of St. Paul, which are as true today as when uttered:

> "Now he that planteth and he that watereth are one, and every man shall receive his own reward according to his own labor."

Among the first settlers of the colony of Virginia, was a group of so-called gentlemen adventurers who held that it was beneath their dignity to labor with their hands as the rest of the colony was obliged to do in order to live, and announced that they would do no manual labor. Thereupon that grim old soldier, Captain John Smith, informed them that those who did not labor would not eat and, in a very short time, the few who esteemed themselves above work, were glad to produce in order that they might eat.

The pressing problem, therefore, is to get everyone to understand that he should go to work and keep at it. The duty of bringing this home to everyone rests upon every citizen, and the situation is so grave that it requires him to discharge it to the fullest extent that his position and abilities permit. A cheap dollar makes an improvident people. The only way to put the missing 45c worth of purchasing power back into the dollar is to put behind it 45c worth of created value. Value cannot be restored or created by political platforms, by the vaporings of would be economists, the clatter of agitators or by legislation. It can only be created by honest to God labor doing a fair day's work for a fair day's pay.

If a penny saved is a penny earned, it is true that a penny saved is equal to the value of one produced. It thus becomes clear that, in addition to everything else that we may do within the scope of our respective situations in life to aid in the return to a normal state of living, much can be accomplished by rightly directed attention to the prevention of waste of all kinds, not the least of which is the waste of potential productivity of existing facilities as well as the wise direction and application of labor.

The attention that the war forced to conservation resulted, as we all know, in saving many things that before had been wasted, but war time activity did not exhaust the field for improvement in this direction. Accepting the definition of efficiency as "the accomplishment of a maximum result in a minimum of time," we can all take this thought back into our respective shops and places of business and by taking a new interest in the problems of conservation of material, labor and facilities get results as startling as they will be satisfactory. The point is that this is a continuing job and one that, in the nature of things, is never finished.

One of the costliest delusions that ever infected the brain of man was the idea that improved facilities robbed labor of its bread. It is true that the great labor leaders today are trying to teach their followers the elementary principles of political economy; but wrong ideas, inherited through countless generations, cannot be rooted out even by the counsels of the wisest men in a few years. Akin to the vicious idea that the machine is the enemy of the working man instead of his good friend, is the no less vicious idea that the restriction of production should be practiced by workmen to prevent a surplus, because otherwise there will be periods of idleness, until the excess products are consumed. Speaking generally, and taking the world's produce in the mass, there cannot be any such thing as over-production and the simple reason which has been known for 3,000 years at least, is the fact that human wants are never satisfied. This fact is just as well established as any law of nature and is so important that the difference in the number and character of wants may be said to be the difference between the savage and the civilized man. The spot where we stand today would still be a wilderness and the land still occupied by savage tribes, if it were not that human wants can never be satisfied.

To illustrate how deeply these wrong notions are implanted into the minds of men, I recall that some years ago in one of our shops we had a turret lathe operator who, previous to entering our service, had worked in a forge shop making ball pien hammers. It was learned that he had earned from 25 to 30% more making hammers than he did running the turret lathe for us, and the explanation that he gave was that the forge shop was turning out so many ball pien hammers that it would only be a few years before the country would be over-stocked and thus throw him out of employment. To my mind, this case is pathetic and not at all humorous because that man expressed the honest fear and anxiety, through lack of opportunity to know better that exists, and persists, in the minds of millions of workmen today.

They need light and we can all be torch bearers, and perhaps imitate to advantage the fearless curiosity of the young fellow in the following story. A young woman disturbed about the state of grace of her sweetheart prevailed upon him to go with her to hear Billy Sunday. Billy was in great form, and opened fire by shouting the question "What did Esau say?" He threw off his coat, waved his arms and again thundered "What did Esau say?" The young fellow had stood the strain as long as he could and he shouted, "I'll bite, what in H—— did he say?"

This was not fitting language for a revival meeting but it showed that the young scamp had an active curiosity and the initiative and courage to try to gratify it. It is better to be the "goat" and "bite" and thus learn something than to save one's face and learn nothing. A willingness to seek information and to impart it results in better understanding all around, and increases efficiency. It may be no disgrace to be uninformed. The disgrace is in being satisfied with a state of ignorance.

The matter of supervision should not be overlooked. "The proper study of mankind is man" and, therefore, supervisory forces must study their men, if they expect to get along with them and get results. A knowledge of human nature is essential to one who aspires to govern. Conditions change but human nature never does and never will. It is the same now down into the roots of life as it was in the beginning. Just and considerate treatment is the birthright of every one, and men are just as susceptible to kindness and courtesy as they ever were. It is well to remember that men, like boilers, may be divided into two classes—internally fired and externally fired. The energizing force is developed within in one case; in the other from the outside and must have external inspiration and guidance. It is the business of those in authority over men to understand this. It is the prevailing fashion to blame all the sins of under-production and sabotage and all the other ills, to which industry is heir, on the man who works with his hands, but it is time that the supervision of this country awakens to the fact that it is, in many cases, as much to blame for all these conditions as the men it supervises.

In Europe and particularly England, the doctrine is put forth by the prophets of unrest that "work is to be a mere incident to life." Such doctrines have no place in America and those who openly accept them, or, what is the same thing, let their actions work an acceptance, are following the Red Flag no matter how sincerely ignorant they are of the fact, and regardless of their indignant protests of loyalty to law and to American institutions.

This idea, if it persists, will eventually reproduce here the economic situation prevailing in England, which caused the President of the International Confederation of Labor to warn the people that:

> "Yesterday we lived on our savings and our earnings, today we live on credit; tomorrow, if we live at all, we shall be living on charity. Is there a way out? There is, but it will be via the mine, the mill and the workshop, not via Westminster. Work rather than politics will save the situation, though it will not save the suffering which the past three years of economic foolishness have stored up. Revolution, if you like; strike, if you like. But neither revolution nor strike will fill empty stomachs nor clothe the unclothed bodies nor provide houses."

Let these false doctrines be nurtured, if anywhere, in the soil that gave them birth, but let us do our part to prevent inoculating the soil of America to give kindly nurture to such alien weeds. We live in the golden age of the world, no matter what the uninformed may think. We live in the best country in the world and under the best government, everything considered, that man has devised. We must learn to make these facts part of our religion and take an interest in our duties of citizenship above all other earthly considerations. We are citizens before we are employers and employes. Regardless of the business we follow, each individual must obey the law and when our activities run counter of the law, we must take a new tack.

We were all willing during the war to make any sacrifice to insure the success of our arms. Now the common purpose seems to be to make up in extravagance and waste for the voluntary restraint and sacrifice we practiced for a while. "America always" is as good a slogan, and as necessary, if we are sincere, in peace as in war. We are prone to accept all the advantages that our country can give us and to invoke every right we have, but as a people we refuse, except in great emergencies, to discharge the duties of citizenship that are set over against every right we enjoy.

That love of country that makes us one people must find an affectionate response in every heart that beats under the protection of our flag. Hearts that do not and cannot respond to this inspiration are not filled with American blood and have no business here. The accident of birth does not make an American, but undivided allegiance to our government and love and respect for our institutions.

Any compromise with the forces of disorder and every encouragement to the false and despicable propaganda of the throw-backs that now rule Russia menace the liberties of America, and it is of the highest importance that everyone be on the alert to attack with courage and vigor every manifestation of these dangers. This is not an appeal to

the mere sentiment of patriotism, but the statement of a solemn truth which must in every possible way get a wide diffusion. I dwell upon this because active citizenship is the foundation of our national life. Unless, therefore, we do our full duty as citizens to preserve the standards of our national life, forces with which Americans have no sympathy, and which they have always abhorred, will surely get a foothold to exercise their evil and corrupting influence, to our lasting injury.

I am glad to be here today for several reasons: First, it is a great honor and an equally great pleasure to be privileged to address such a gathering of earnest men, many of whom are personal friends and all of whom I would welcome to that relation. The second reason is that this country is an old stamping ground of mine where I spent some happy years. There are still some family and other friendly wigwams that open invitingly and hospitably for my reception. There are some other reasons but I am not going to state them.

It strikes me that I have talked about enough. "Talk," it used to be said, "is cheap but it takes money to buy a whisky." It is, and it does.

I hope that I have said nothing that any one has construed as cheerless or discouraging. I try to be an optimist, if for no other reason because it makes life more cheerful. I have faith in men and a firm faith in the future into which the world is peering with such mixed emotions. To hope for the best and work for the best is the highest service we can give. That is the least we are going to give.

RESPONSE OF MR. P. J. CONRATH.

Mr. President, Ladies and Fellow Members of the Master Boiler Makers' Association:

In response to Mr. Schlafge's address, I wish first to thank him for so kindly giving up his time and coming here to address our Association. It is an encouragement to us at all times; it spurs us on to better deeds and higher efficiency, which I believe we need, and it is very much appreciated.

Referring to your remarks regarding the poker game: I do not believe the Boiler Makers need any further instruction along those lines as they have studied the game from every angle. I agree that they are a noisy class, but it is necessary to be noisy to be a Boiler Maker.

I will relate to you a true story relative to something which happened while they were recruiting for the war: The Engineer Corps wanted a dozen first class Boiler Makers. They were selected from a first class lot in one of the largest railroad shops in the country and sent before the Examining Board. Later the Secretary of the Board wrote a letter to the Superintendent of Motive Power and asked him to please send some more Boiler Makers, as the men they sent had failed to pass the examination. He again called his Foreman Boiler Maker and asked whether the best men he had in the shop had not been selected. He said they had and he didn't understand why the men had not passed. "Well," the Superintendent said, "you will have to select nine more men and send them before the Examining Board." The Foreman sent nine more of the very best men in the shop. A few days later the Chairman of the Board called up the Superintendent of

Motive Power and said, "None of the Boiler Makers you sent has passed the examination." "Well," the Superintendent said, "we sent the very best men we had and I wish to ask what is the trouble and why they have not passed the examination." The Chairman of the Board answered, "They do not hear good." (Laughter.) Then the Superintendent remarked that if the Board wanted first class Boiler Makers they would have to take the men that did not hear good; that as a rule the man with good hearing was not a good Boiler Maker. (Laughter.)

It is a well known fact that the Boiler Makers have sacrificed, at least in part, one of the five senses given them by their Creator for the welfare of the public—their hearing.

I wish to further say that greater efficiency is needed most everywhere in the large shops and manufacturing plants. A talk by a man of Mr. Schlafge's experience is something that will inspire us with more energy and help us to increase the output in our shops, which, I understand from Mr. Schlafge's statements, has decreased in some places to an alarming extent. I feel, however, that this does not apply to the Boiler Shop. As a rule, the Boiler Makers are interested in their work, and will always give a fair day's labor for a fair day's pay.

With regard to Mr. Schlafge's statement relative to a Boiler Maker that used profane language, I believe I remember the instance very well. However, he is mistaken; it was not a Boiler Maker, but a machinist. (Laughter.)

In conclusion, it gives me great pleasure to see such a large gathering here. I hope you will all take an interest in the subjects as they come before the convention, and take part in their discussion. By getting the different opinions of men from various parts of the country it will help to reach the proper conclusion, and with everybody taking an interest you surely will have a successful convention. Thanking you for your attention.

ADDRESS OF PRESIDENT JOHN B. TATE.

Master Boiler Makers and Members of this Association, Ladies and Guests:

GENTLEMEN: It is with pleasure I greet you, on this, the 12th annual convention of this Association. I am not unmindful of the honor conferred upon me by electing me as your President at our last annual meeting, nor have I overlooked the responsibility of the office. Coming into closer contact with the different officers of the Association, I have found them men of exceptional ability, and willing and anxious at all times to faithfully perform the duties of the office they hold, of which we should be proud.

In the past, and hopeful it will be so in the future, one of our greatest assets has been the number of ladies attending the conventions. We should feel honored by their attendance. It has been and will continue to be a great help to us.

We feel honored with the presence of so many gentlemen of distinction, from State, Municipal, commercial and railroad circles. We extend to them a most cordial welcome. Last year our convention was very largely attended, largely due to the hearty support of Mr. Frank McManamy, then Assistant to the Director General, as well as Mr. Pack, Chief Locomotive Inspector. These gentlemen deserve great credit for their efforts in assisting our members to get together, and I hope that they are with us this year, as they have always been able to give us some valuable information along our line. We have advanced so rapidly in boiler construction in the last 10 years that we must keep in very close touch with it or we will certainly soon be a back number, in our business we must push on or fall to the rear and that very soon.

How often have we heard that we had reached the limit. For my part I do not think we have. The demand placed upon the Transportation Department has been so great and still getting greater, that something must be done to help them out. So the Engineering Department has to design locomotives to haul heavier loads, say 150 cars and 150 tons each, and boilers that will have to furnish the power for them will have to be built and taken care of, to keep them safe and serviceable.

Reports of committees investigating the various subjects have required deep thought and an expenditure of time and labor. The subject of stationary boilers should be given very careful thought, particularly as to care and upkeep, and the demand has advanced very rapidly for more efficiency, brought about by scarcity of coal, and the high cost of labor and various designs of mechanical tools which are necessary to-day. In some parts of our country the electric locomotive and heavy trolley car service has taken the place of the steam locomotive and necessarily the power house boiler must be maintained to the highest point of efficiency.

We are passing through a period of reorganization of the physical powers of the world and it is necessary for each one of us to broaden ourselves to be able, as leaders or supervisors of forces, to be right. As we are making history let the records show that the men who are handling and supervising the affairs of reconstruction, are men of sterling qualifications, men of principle as well as appearance, and not beings who wear men's clothing. We are living at a time when it is necessary for careful decision and firmness, as so many men around us have a desire to live a life of antagonism to all things that are right and fair, and we should, in order to make life worth living, insist upon what is right.

THE PRESIDENT: The ladies can now retire if they wish to, but if any wish to remain we will be pleased to have them do so.

We will now have the Secretary's report.

ANNUAL REPORT OF THE SECRETARY

New York, April 25, 1919.

To the Officers and Members of the Master Boiler Makers' Association.

GENTLEMEN: The undersigned begs leave to submit the following report of receipts remitted to the Treasurer since the convention held in Cleveland in May, 1916:

1916-1917		
From dues	$912.00	
From initiation fees	156.00	
From miscellaneous sources	45.25	
Total		$1,113.25

1917-1918.			
From dues	$484.00		
From initiation fees	6.00		
From miscellaneous sources	2.00		
Total		492.00	
1918-1919.			
From dues	$460.00		
From initiation fees	33.00		
From miscellaneous sources	4.00		
Total		497.00	
Total remitted to the Treasurer for the three periods			$2,102.25

MEMBERSHIP RECORD

It has been customary for the Secretary to give the status of the membership in each annual report. For obvious reasons this is not attempted at this time, as the membership record was so badly shot to pieces by conditions incident to the late war that it would be disappointing and unsatisfactory. It has therefore seemed best to defer it until some time before the convention adjourns, if time and circumstances will permit of its compilation, or until the Proceedings are published, when it will be more complete and reliable.

For the present it may be stated for your information that counting delinquents and those who had put themselves in good standing at the date this report was prepared we had nearly 600 names on the membership roll, 31 applications having received the endorsement of the Chairman of the Executive Board, subject to ratification by this convention.

It is most gratifying to say that following the announcement of the present convention being decided upon there was a generous response to the request for advance payment of dues, especially by those who were delinquent for several years, and in several instances the payments were for as many as 10 years. This was a good augury, as undoubtedly all will agree. It indicated that with favorable circumstances there was a lively interest in the work and purposes of the Association. It also emphasized the faith of your officers in the future of the organization, and the high opinion of its aims and objects entertained by those who had been instrumental in its foundation and progress in the past. The confidence of those who have never wavered in their judgment as to the outlook for further strength and advancement has been justified. Conditions now make it possible to resume and continue activities that heretofore were so successfully conducted for the benefit of those the Association is intended to serve. Every pleasant anticipation is in a fair way to be realized. It may be said too, that the value of membership in the Association has been magnified to a degree that should leave no question as to greater achievement and increased numerical strength in the years to come.

In closing this report the Secretary acknowledges with high appreciation the courtesy and consideration constantly received from officers and members alike since our last convention. He also takes this opportunity to express sincere gratitude for the solicitude and many messages of kindly concern with fraternal greetings, and best wishes received during two periods when he was fighting for his life and restoration to health. May good fortune, prosperity and success attend you all.

Respectfully submitted,

Harry D. Vought

Secretary.

Earl L. Kline of New York, certifies as an accountant that he has made an examination of the books and accounts of the Secretary, and has reported to the President that he found them correct.

THE PRESIDENT: Gentlemen, you have heard the report of the Secretary. What is your pleasure?

On motion the report was ordered received and filed and included in the Official Proceedings.

THE PRESIDENT: We will now hear the report of the Treasurer.

ANNUAL REPORT OF THE TREASURER.

Columbus, Ohio, May 1st, 1920.

TO THE OFFICERS AND MEMBERS OF THE MASTER BOILER MAKERS' ASSOCIATION:

GENTLEMEN: I beg leave to submit the following statement of my office as Treasurer for the fiscal year ended April 30, 1920:

RECEIPTS.

Balance forward from last report April 15, 1919	$ 503.44
Received from Secretary during term	2,675.60
Interest on deposit	9.68
	$3,188.72

DISBURSEMENTS.

Stationery and printing	$ 784.21
Secretary—percentage on dues collected	759.00
Clerical and stenographic hire	185.00
Premiums on bonds for Secretary and Treasurer	15.00
Personal expense of Secretary attending Chicago convention	285.85
Postage	4.75
Refunds—rejected applications	30.00
Certificate of deposit No. 75759 (Ohio National Bank)	1,000.00
Miscellaneous items	85.10
To Balance	39.81
	$3,188.72

ASSETS.		LIABILITIES.	
Cash on hand and in bank.	$ 44.81	Unpaid Voucher No. 107 (6/28/19 J. H. Brooks).	$ 5.00
Certificate of Deposit No. 75759	1,000.00	Net Assets to balance	1,062.31
Accrued interest on deposit	22.50		
	$1,067.31		$1,067.31

Respectfully,

W. H. LAUGHRIDGE,
Treasurer.

Columbus, Ohio, May 8, 1920.

THE MASTER BOILER MAKER'S ASSOCIATION.

GENTLEMEN:—This is to certify that I have audited the records of Mr. W. H. Laughridge, Treasurer for the Master Boiler Maker's Association for the fiscal year ending April 30, 1920, and have found same to be correct.

Respectfully,

HENRY W. THRALL,
Chief Accountant, H. V. Ry. Co.

Subscribed and sworn to before me this 11th day of May, 1920.

F. D. METCALF,
Notary Public.

Letters of regret that official duties prevent their attending the convention and honoring the Association with the addresses for which they were scheduled, have been received from Mr. A. G. Pack and Mr. Frank McManamy. Also from Mr. Stephen E. Westover of Portland, Ore., Mr. W. J. Sprouse of Globe, Ariz., and Robert Russell, Boiler Inspector of the Grand Trunk Railway, Battle Creek, Mich. Mr. Westover, in his letter, which is addressed to the President, says:

> "I notice, by the way, that your program deals altogether with locomotive boilers, and that the subject of marine boilers is not touched, except indirectly, as some operation may pertain to both kinds of boilers. The manufacture of marine boilers is a very important item in boiler building, therefore, I think it would be advisable to give more attention to the discussion of this subject, as its importance is world-wide. For instance, we have built these boilers for shipment to Panama, China and Japan, and it was necessary for them to pass the most critical inspection both here and in the countries to which shipped. Therefore, I believe this branch of the industry should be given more consideration at future meetings.
>
> "I wish it were possible to be with you this month to renew old friendships, and to see some of the "boys" of whom I hear

often, but whom it has not been my good fortune to meet for a number of years. My regret is sincere that I will not be able to do so this year, but I am looking forward to that pleasure at some meeting in the near future."

You will notice by the Secretary's report of all deaths which came to his knowledge after the adjournment of the 1919 convention, that the members you lost were:

James W. Spencer, Chief Boiler Inspector of the Chicago Great Western, who died December 12, 1917, and William Crum, a retired Honorary member of this Association formerly with the Chicago Northwestern, who died March 8, 1920.

The President appointed committees to draft suitable memorials and they have reported the following:

IN MEMORIAM

To the Late James W. Spencer

It having pleased our Heavenly Father in His infinite wisdom to remove from our midst, December 12th, 1917, Mr. James W. Spencer, this Association has lost a true and loyal member, a man of sterling worth, and his wife a devoted husband. Be it

Resolved by the Master Boiler Makers' Association in convention assembled at the Curtis Hotel, in the City of Minneapolis, that we express our heartfelt sympathy to his widow and loved ones in their bereavement; that a copy of this resolution be sent to Mrs. James W. Spencer, and that it be printed in our Official Proceedings.

J. F. Eischeid, Chairman
C. A. Smith
R. B. Bresette
Committee.

To the Late William Krum

Whereas, it has pleased almighty God in His infinite wisdom to remove from our midst our beloved brother and fellow workman, William Krum, be it

Resolved, That we, his associates, while deeply mindful of our loss, bow submissively to the will of Him that doeth all things well, and we extend our heartful sympathy to his bereaved wife and children, and pray to God, to comfort and console them that they may bear their trials with fortitude: Be it further

Resolved, That a copy of these resolutions be sent to his family and spread upon our minutes of the meeting.

M. O. O'Connor, Chairman
T. F. Powers
Thomas E. Burdett
Committee.

Probably you have all noted the absence of Mr. John H. Smythe, one of your oldest members, and the Official Chaplain of this Association. Mr. Smythe has been passing through a very great trial, one of the hardest that can come to any man, in the critical illness of his wife for many weeks. It is gratifying to know that she is steadily recovering. Mr. Smythe advised the Secretary that as soon as Mrs. Smythe was able, he felt his first duty was to his wife, and that he should take her where she could recuperate and be entirely restored. He desired his very kindest greetings extended to each and every member of the Association, and expressed his sincere regret that he would not be here to perform his official duty and join with you in enjoying the success of this occasion.

Invitations for your next convention have been received from 15 or 20 cities including, as usual, one from St. Louis, which is patiently awaiting the time when the Executive Board will think it well to go to that city.

Two resignations have been filed since the last convention; one from Hugh W. McGuire of Phillipsburg, due to his retiring from business. I am not going to tell you who the second was from because it was my pleasure to meet the gentleman about two weeks ago, and I said to him: "You are a personal friend, and I know you are a friend of a great many men in that Association who have been more or less associated with you. In view of their effort to promote the success of the Boiler Makers' Association, and bring it forward to twice the membership it has now, will you authorize me, please, to scrap your resignation?" He didn't answer immediately. Whereupon I said to him further: "You know it is your duty in the position you occupy to support the Association by remaining a member, and thus encourage those who stay in line like good soldier." And he surrendered!

THE SECRETARY: A committee was appointed on an invitation to unite with the American Railroad Association, Section III, Mechanical. The matter I believe is in the hands of Mr. Raps, Chairman of the Executive Board. The Secretary is not advised whether it has been acted upon.

MR. T. F. POWERS: I don't believe that Mr. Raps is in the room. As a member of that committee on amalgamation of our Association with this one big association, the consensus of opinion of the committee was that the matter be dropped: that it be so ordered by the Executive Board.

THE SECRETARY: If the Secretary has correctly interpreted Mr. Powers' statement, he assumes that the committee recommends that the subject be dropped by the Association.

MR. POWERS: Our opinion in regard to that was that if we amalgamated with the American Railroad Association we would lose our individuality, and that is something we don't want to do. We thought the best and most diplomatic way out of it was to let the subject drop, and say nothing more about it.

A MEMBER: Wouldn't it be a good idea to lay it on the table?

A MEMBER: Make it a motion.

THE PRESIDENT: I would be very glad to have somebody make a motion to that effect.

A MEMBER: I move that we lay that communication on the table.

THE PRESIDENT: It has been moved and seconded that we lay on the table the communication concerning the American Railroad Association, Mechanical Section.

(Motion carried.)

THE SECRETARY: Permit me to suggest that invitations received for the next convention and any others that may be sent within a short period, be referred to the Executive Board. They alone select the place for the convention.

On motion it was so ordered.

The President announced the appointment of the following committees:

Resolutions: A. N. Lucas, Louis R. Porter, John O. Crites.

President's Address: George W. Bennett, C. E. Elkins, T. F. Powers.

MR. E. W. YOUNG: It has been customary for every organization in this country to remit the dues of those who answered the country's call and went into military service—at least for every one that I know of. We have two members who entered the Russian railway service corps: Captain Martin Guiry and Captain B. C. King. In order to receive their badges and be put in good standing they paid their dues. I believe we are broad enough to join with all other organizations and refund their money. I make a motion to that effect.

Three different members simultaneously seconded the motion, amid applause.

THE PRESIDENT: It has been moved and seconded, that the dues of members who have been in military service be refunded—that is for the years 1918 and 1919.

MR. YOUNG: No. They were in service 26 months. I made the motion that all back dues they had to pay be refunded, because they were not in the country at all.

MR. JAMES T. GOODWIN: Wouldn't it be very nice now to have our people recognize the services that these men rendered, by remitting their dues for the rest of their lives?

Mr. Laughridge: I heartily agree with Mr. Goodwin and recommend that the Committee on Law be instructed to so amend the By-Laws as to permit of such life membership.

It was further moved that a committee be appointed to draft resolutions pertaining to the men who did service in the war, and report before the close of the convention.

The Secretary: If the object Mr. Goodwin has in mind is proper, the power to carry it out is in the hands of the Executive Board on instructions from the Association. To relieve them of all dues for the remainder of their lives they might be made honorary members, recommending to the Executive Board that the necessary action be taken.

A Member: I wish to emphasize that they will be active honorary members.

Mr. Laughridge: I still maintain that I was right in regard to amending our laws so as to provide for life membership. We have never done that; and I believe it could be taken care of by a proper motion.

Mr. Patrick: Gentlemen, I am going to oppose this action. I don't believe the Association should remit dues to any one.

Mr. Powers: I don't believe it is the sense of this convention that dues should be remitted to anyone who has been in military service for a longer period than the time they were in service. I don't believe the men themselves want us to remit dues for the rest of their lives.

Mr. Whelan: Nine-tenths of the men who went to Europe in the service of the Government deserve everything they can get and more. I have a full history of what went on and what they went through with; and if a man went to Russia in the service of the Government, our place back here is nothing compared with what he went through with. We had our three meals a day. We were getting a fabulous salary—a good salary. True, we worked hard; but we didn't go through the hardships they did.

When my boy came back and talked about sleeping on frozen ground with a blanket wrapped around him in snow six inches deep on him next morning, and without food 32 hours—why talk about our deserving the same credit?

You don't know what they went through with; the majority of us here will never realize it, because they are not going to tell it all. It is hard for me even to pull a conversation out of my boy with a corkscrew, because he says he wants to forget it.

Members of this Association who went to Russia have endured enough hardships probably to be entitled to their dues in this organization for the rest of their lives. (Applause.)

Mr. Patrick: I appreciate all that Mr. Whelan has said; but there is absolutely nothing in it, to remit two dollars a year.

MR. YOUNG: Mr. President, I would suggest that the Association accept my motion and then let the Committee on Law and the Executive Board handle the rest of it.

MR. PATRICK: I make an amendment to the motion, to refer to the Executive Board.

THE PRESIDENT: Are you ready for the question? This includes the motion on the amendment.

THE SECRETARY: No: Mr. Patrick's amendment first.

THE PRESIDENT: Well, the amendment to the motion is to refer the entire subject to the Executive Board. Are you in favor of the amendment? Signify by saying aye. Contrary?

THE SECRETARY: Mr. Young moved (which was the original motion), to commute the dues of Captain Guiry and Captain King for the years which he named. That was the original motion.

Mr. Goodwin moved that their dues be remitted for the rest of their natural lives. That was an amendment.

Mr. Laughridge moved to so amend the Constitution and By-Laws as to create a life membership, which should provide for these and other cases.

Mr. Patrick's motion is to refer the entire subject—which is a further amendment—to the Executive Board with power. That is the motion before the house, Mr. President, and it is not debatable.

A motion to refer or to adjourn is always in order, and is not debatable. Two motions in a legislative body take precedence at all times—to adjourn or to refer. The pending motion is to refer this entire subject to the Executive Board. That motion is properly before the house, and is not debatable.

The result seeming to be in doubt a rising vote was taken and the motion was declared carried. It was suggested by a member that in fixing the date of the next annual convention the Executive Board should confer with the Executive Committee of the International Fuel Association so that there would not again be a conflict of dates and the two organizations meet simultaneously in different cities. Attention was also called to the fact that the Boiler Makers' Association had always met in the last week in May and the Fuel Association the preceding week.

THE SECRETARY: Had there not been a conflict of dates this year men who have always attended this convention would be here. Unavoidable conditions and circumstances compelled them to go to the meeting of the Fuel Association in Chicago. One of them told your Secretary he had no choice in the matter. The President has asked me to call your attention to the fact that under the Constitution and

By-laws the Executive Board alone has authority to determine the time and place for the annual conventions of this association.

Mr. Thomas F. Powers: In behalf of the Executive Board I want to say that we set the date for this convention last October. So far as we could learn at that time the dates we selected did not conflict with those of any other organization. Furthermore, the Master Boiler Makers' Association had been holding its conventions the last week in May for the last 12 years. The Fuel Association is about five years old. We do not think we should make inquiries, as to a conflict of dates, from any organization that is younger than we are. We are older, and perhaps stronger, than they are.

Mr. P. J. Conrath: The Master Boiler Makers' Association is one of the oldest mechanical associations in the country, and, as I have always thought, one of the best. This organization was in existence long before the Fuel Association was organized. Our convention has always been held about the last week in May. This is pretty well understood, I believe, by nearly all railroad men. I see no good reason why the officers of the Fuel Association should not this year have taken up the matter with the officers of the Master Boiler Makers' Association and avoided a conflict of dates.

The Secretary: My views are in accord with those of Mr. Powers and Mr. Conrath, but in all probability the Fuel Association did not consult your Executive Board and perhaps may not do so hereafter for reasons not within its control. You have forgotten that it is now allied with the American Railway Association which now is the controlling factor with respect to the annual meetings of minor organizations that have come under its jurisdiction, notably the General Storekeepers and others that are now independent branches of Section III-Mechanical. (This Section has since been made the Mechanical Division by action of the Committee of Executives of the railroads.) Your Secretary, for reasons which he cannot with propriety mention in detail at this time, sincerely regrets that the Executive Board did not find it possible to follow up the idea of seeking admission to the American Railway Association as closely as did the Traveling Engineers, the Storekeepers, the Master Painters, the Fuel and other associations which ultimately, after investigation and recommendations made by special committees or their executives, decided in favor of amalgamation. They were admitted to the Association without any loss of individuality or the identity of their respective organizations. They are functioning in that regard just as they did originally, electing their own officers, holding their own meetings, etc., but undoubtedly fixing dates so that the convention of one will not conflict with another. This has unquestionably operated to their mutual advantage. Possibly you may have noticed that the Master Car Builders and the Master Mechanics are to meet one week earlier this year than they have heretofore and this may have been necessary to prevent conflict with dates wanted by other associations. This is simply an assumption on the part of your Secretary for he has no personal knowledge of the arrangements, but construes what has been done as indicating the probable explanation.

Perhaps it might be further assumed by some that the associations which have amalgamated have been actuated by selfish motives but that is very doubtful in view of what your Secretary has been told by members active in those associations and in promoting acceptance of the proposition which led to their action.

These are just simply the facts, imparted solely for your information and understanding, so that you may not be misled or get a false impression. Your Secretary has no personal desire to gratify, is making no argument, nor any special plea except such as concerns the best interest, progress and welfare of the Master Boiler Makers' Association. It is not unlikely that conferences with the proper authorities and investigation by your Executive Board will disclose you have in some way gained a wrong idea. If the Board finds it will not be to your advantage to be identified with the American Railway Association, and that it will deprive you of your individuality—that you will lose the identity you and your officers from year to year have worked so industriously and intelligently to obtain—STAY OUT! But certainly the fact that so many of the minor organizations—practically a majority of them—have sought and obtained recognition and admission, is suggestive. Something must have been found to convince them that there was much to gain and nothing to lose, not even individuality or prestige. Your interest and your benefit is my first and controlling thought. After all the service given to you for so many years, and the fraternal and much appreciated relationships established, it could not be otherwise; but if the Executive Board finds that with the Master Boiler Makers there is a different condition and they would find themselves in an atmosphere not congenial or beneficial, then remain as you are and no one will be quicker to concur in the judgment of the nine wise men of your Executive Board than your humble Secretary.

A MEMBER: My object has been attained. The subject will now be discussed pro and con. We are living in an age of change and perhaps it is to affect us; but whether it does or not, the other fellows will hear of us in an unmistakable way and know who and what we are—that we are not to be unwisely cajoled and that we know our business.

MR. JOHN F. RAPS: At one of the board meetings held in Chicago the matter of affiliating with the American Railroad Association came up and a committee was appointed to investigate the matter and report at the next meeting of the board. I arranged with Mr. Fairbanks for a meeting with the committee but owing to unavoidable circumstances only two members of the committee were able to be present. Since that time I have made four or five attempts to arrange for a meeting with Mr. Fairbanks but without success as he was either out of town or busy. So up to the present time the committee has made absolutely no progress in their investigation in regard to the standing of this association in case we join the American Railroad Association.

Personally I feel that it is a matter to be decided by the members while in convention. We are all acquainted with the object and purpose of the American Railroad Association and we know one benefit that will be derived from affiliating with it. I trust there are members present who are either members of some of the various associations which have affiliated with the American Railroad Association, or are familiar enough with the present status of those associations to be able to enlighten the members of the convention as to whether or not they have lost their individuality as associations. I do not see where they do. I do not see any reason why they should. But if there are members here who know, or who have talked with any of the members of the other associations who have aligned themselves with the American Railroad Association, and they feel that their association has had a loss of prestige and of their individuality, then I feel that the Master Boiler Makers' Association should keep out. But if they have not lost their individuality or prestige I feel that this Association should affiliate with the American Railroad Association.

THE SECRETARY: I would like to know whether Mr. Powers has at any time communicated with Mr. W. O. Thompson, who is chairman of a committee on this question, Mr. Fairbanks' multitudinous duties making it impossible for him to personally handle it. Mr. Thompson is now general superintendent of rolling stock of the New York Central at Buffalo. He used to be at Cleveland. As chairman of a committee for this purpose, he can give the information wanted. If there has been no conference with Mr. Thompson, and the motion before the house is carried, it will be possible to go on and make further progress in time to report to the next convention of this Association.

MR. POWERS: I addressed my communication to Mr. Fairbanks. If this other gentleman was the person to give such information, we should have been so advised, but it was not done. Mr. Fairbanks simply said that he was unable to meet our committee.

The motion to refer to the Executive Board was carried.

THE SECRETARY: The Secretary has no further business for this session.

On motion the convention adjourned until May 26th at 9.00 a. m.

SECOND DAY

The convention reconvened at 9 a. m.

THE PRESIDENT: The convention will come to order.

First in order is an address by Mr. John M. Hall of Washington, D. C., Assistant Chief Inspector of the Bureau of Locomotive Inspection of the Interstate Commerce Commission, who will give us some stereopticon illustrations of defective equipment and results of boiler accidents, the pictures having been taken by inspectors of the Bureau. While Mr. Hall is preparing to show the pictures the Secretary has some announcements to make.

THE SECRETARY: Unquestionably every member in attendance has noticed with regret the absence of Mr. Frank Gray, your fifth vice president, and for many years before, your treasurer. In a letter to your Secretary Mr. Gray extends his greetings to each and every member of the Association, with his best wishes. He was compelled to go to California for a considerable period during the past winter in order to continue his physical improvement and was greatly benefited, but he feels that while in comparatively good condition and working every day, after his prolonged absence in California, with conditions that obtain on the railroads today he could not consistently ask the company to grant him any further indulgence in the way of another leave of absence for the purpose of being here. He wished it understood that he would be here in spirit, and that his heart and mind would be with the Association now as it always has been. Mr. H. M. Curry, Mechanical Superintendent of the Northern Pacific, was on the schedule for an address. In a letter to Mr. Porter, chairman of the local convention committee, he expresses regret that circumstances have arisen which compelled his departure for the east last night. In this connection Mr. Curry says:

> "I have been looking forward with a great deal of pleasure to attending this particular convention of the Master Boiler Makers' Association; the reasons being on account of my very great interest in the work of the Association; my never having attended a similar convention; my regard for the type of men filling the responsible positions of Boiler Foremen; and lastly on account of my very great desire that the Minneapolis convention be a most pleasant and generally satisfactory one.

> "I wish you all a most hearty welcome to the Northwest. I trust that your convention may be well attended and in every respect all that could be desired; that its work will result beneficially to each officer and member, and to the very important department of our railways that you represent."

The Secretary: Mr. Young has just handed the Secretary an announcement of the death on February 1, 1920, of Mr. C. E. Fourness. Mr. Fourness was district boiler inspector of the Chicago, Milwaukee & St. Paul. The President has appointed H. J. Wandberg, C. M. Klink and J. T. Wilson a committee to prepare a memorial to the late Mr. Fourness.

Will the President kindly indulge the Secretary in saying at this time for the benefit of those who are here and all members who will undoubtedly read it in the Official Proceedings, when you hear of the death of a member of the Association, please notify the Secretary at once, so that proper steps may be taken to cover it in our record and to notify the President in order that a committee may be appointed in time to prepare and report a Memorial at the annual convention. It will save time; and it is not easy to prepare these documents on the spur of the moment.

The President: Mr. Hall will now give his lecture.

BOILER EXPLOSIONS AND WELDING FAILURES

Illustrated Lecture by Mr. John M. Hall of Washington, D. C., Assistant Chief Inspector of the Bureau of Locomotive Inspection, Interstate Commerce Commission.

Mr. President, Officers and Members of the Master Boiler Makers' Association:

Mr. Pack, Chief Inspector, Bureau of Locomotive Inspection, wishes me to extend to you his best wishes and also his regrets on account of his inability to attend this convention; however, as it was impossible for him to attend in person, you will have to do as the drug clerks say, "take something just as good"—but it never is.

The general manager has found out at last that it takes training and skill to *properly* design, lay out and build a locomotive boiler; he has found out that a boiler in good condition is more economical than one in bad condition; he has found that the boiler is the heart of the locomotive, and regardless of how good the machinery may be, if the boiler is sick, the locomotive is sick also, and if the boiler dies, the whole train goes to the funeral.

The boiler making industry is now ranking with other industries on our railroads. The boiler maker foreman is an important member of the mechanical staff and the craftsman is no longer looked upon as a "hand," but as a skilled workman. The average boiler maker has gotten away from the old idea that a boiler must be chuck full of rivets to be a strong boiler; that is, he has learned that if he spaces his rivets too close together in the longitudinal seam he is cutting his barrel sheets away, making high stresses in the net section of plate; and if he spaces the rivets too far apart, he has too high a stress on them and the whole will be a weak seam with very little efficiency; he no longer believes that any kind of a patch applied in a haphazard manner with any kind of material will restore a sufficient amount of strength to a defective boiler—but he knows that his patch material must be of sufficient thickness—his rivets must be of sufficient size, and properly pitched to have a job that will leave the boiler with a proper factor of safety for the working pressure carried, and I think that I can say, gentlemen, without egotism, that the boiler inspection law, and the inspectors of this bureau, have played a very large part in bringing about these things, with the co-operation of the membership of this Association.

You gentlemen have always wanted to keep your boilers in good condition, but unfortunately before there was a Federal law on the subject you were very often over-ruled by your superiors; consequently the locomotive received a new firebox, or a set of flues, or the boiler was washed out at some *convenient* time, and in the meantime you had to "please note and advise why the 999 fell down on the road last night."

Lest we forget, who remembers our old friend the flue plug when 45 to 50 per cent. of the flues had to be plugged before the flues were bad enough for removal?

Who remembers when the railroads had boiler inspectors only at their back shops and broken staybolts were removed when the locomotive received general repairs, if an accident did not occur in the meantime? Of course, some roads did have boiler inspectors at their large roundhouses, but before there was a Federal Boiler Inspection Law a great many did not.

Now, gentlemen, if you will bear with me for a few minutes we will put out the lights and show you some slides made from pictures taken by our inspectors of some defective equipment and the results of various kinds of accidents.

The stereopticon views were shown of the results of disastrous locomotive boiler explosions, accidents caused by failure of some part of the locomotive, the failure of welded firebox seams, some contributing causes to crown sheet accidents, and failure of main air reservoirs, etc.

The following are a few excerpts taken from Mr. Hall's lecture:

Showing another reservoir that exploded, killing an employee. This reservoir had wasted away close to the longitudinal seam. A few blows with a hammer were sufficient to rupture the remaining sheet, and disclosed that it was less than $\frac{1}{32}$ inch thick. This locomotive received Class 3 repairs less than two months previous to the accident. The law requires that main reservoirs shall be subjected to hydrostatic test at least once each year, and the entire surface hammer-tested at each shopping. This illustrates to you, why, if you are held responsible for inspection of the main reservoir, you should insist on it being removed from the locomotive and put on the floor so that when you sign your name to the Federal certificate, as to it having been tested by you, and swear to the certificate, your conscience will be clear, because under the running board, it is a matter of physical impossibility to test the entire surface of the reservoir with a hammer; and you have not satisfied the law if you have only hit it half a dozen times.

The condition of this reservoir could have been discovered 60 days before the accident, if the reservoir had been loosened up and turned in the bands or removed from the locomotive.

(Picture was shown of the end of an arch tube that pulled out of the flue sheet.)

Investigation disclosed that this tube had not been properly applied. It only extended through the sheet $\frac{1}{8}$ inch at the bottom, and had not been applied at right angles to the sheet or beaded to secure it in place. This accident resulted in the death of one person and serious injury to three others, and bad delay to an important troop train. This was while the war was on.

Our records indicate that since the law became effective, 87 accidents of arch tubes, resulting in the death of six persons and the serious injury of 124 others, were due to failure of arch tubes, which forcibly illustrates the necessity of proper inspection and maintenance of such parts.

There is only one thing to do if you are going to operate arch tubes; and that is, start right. Properly bend your tube, so that both ends will enter the sheets at right angles. After you have them installed and have enough stock left so that the tube can be properly beaded or belled, whichever system is desired, keep your tubes absolutely clean.

The number of different ways that a person can lose his life on a railroad is remarkable. A fireman was killed on this locomotive due to the shaker lever hitting him on the head while he was unlocking it, crushing his skull. Incidentally, a pin connecting the grate rod had lost out and a five inch bolt had been put in its place, no doubt with a nut on it at the time. We know these little nuts don't last long, due to the vibration of the locomotive; and at the time that the fireman unlocked the lever, the bolt fell out and the short grate rod dropped down and struck a tie, forcing the lever ahead. That shows the importance of a little minor detail—of seeing that your pins are properly secured, etc.

(Showing a case where a main driving wheel came loose on the axle and worked in until the wheels were out of gauge.)

Our inspector noted the condition and called the foreman's attention to it. The foreman went to another shop where they had a torch, and being a genius, he burned the end of the axle off and then he took some pin dope and smoothed in the burned part and made a nice, smooth appearance. Our inspector, being from Missouri, dug in and found this condition. If that wheel had caused a derailment and killed the enginemen, that man's conscience would not have been clear to the day he died.

Next is something in which you are interested. It occurred to me eight years ago, when I started with the Federal Government investigating low water cases. One case I have in mind, of an engineer who had been running an engine for 35 years. I looked up his record. Not a scratch of a pen against his record for 35 years on a single track railroad. Yet all of a sudden, he forgets. He is on an engine and he burns the crown sheet. He and his fireman were blown almost to pieces.

That and similar cases have made me think there was something besides neglect—there must be something fundamental on a modern locomotive boiler—that perhaps our water gauging devices are not telling us the exact truth. The chief inspector and all of our inspectors have been of the same opinion; and we have been watching it for years. We have been going ahead slowly, because it is a big question, and a radical one, but it finally came to a head. We went out on various railroads and made actual road tests of a comparison of water shown by the gauge cocks and the water glass. So that we might get a comparison, we had a water column attached to the boiler of a heavy Mallet type locomotive, carrying 240 pounds pressure. Three gauge cocks and a water glass were attached to the column; two gauge cocks in the boiler in the usual manner; the original water glass on the left side, and an experimental water glass attached near the center of the back head.

The original top connection to the column entered the boiler in the right knuckle, slightly above the top gauge cock; we extended our piping over and made a connection near the center line of the boiler in the back head knuckle. Another connection was made on the top of the boiler 14 inches ahead of the back knuckle; all the top connections had independent valves, so that we might take steam from either one by opening one valve, and closing the other two. The two independent water glasses also had two different top connections with separate valves; one entering the back head knuckle, and the other forward 14 inches from the back head and near the center line of the boiler.

Our tests were road tests with full tonnage trains and it was noted that when using steam, the gauge cocks in the back head showed water at all times, and with the top connection to column made in the knuckle, the column was full of water at all times. When the column was connected to the second connection in the knuckle it worked normally until the reading reached 4½ to five inches, when the column and its water glass would fill up and stay full until the general level of water in the boiler was lowered or the connection changed.

Now, we went to the connection on top of the boiler and 14 inches ahead of the knuckle, the column worked normally at all times. The same action was noted in both the other water glasses; that is, when connected to the knuckle they would show full of water, when the water level was about at the second gauge cock, and when communication was changed to the forward connection, the water would settle down in the glasses and show the proper level of water in the boiler.

That demonstrated to us that there was a roll of water up the water legs of our locomotive boilers when working hard, and as in the case with this Mallet locomotive, with a half glass of water, and the engine working hard, that roll up the back leg went clear to the wrapper sheet; we proved that by making our connection in the top knuckle of the back head and closed the bottom valve to the water glass (water valve) and opened the drain cock, the water would flow down the glass from the top, and by closing the drain cock, leaving the water valve closed, the glass would fill up from the top.

We had found this roll of water up the sides and up the back. The next thing was to try and find out the thickness of that roll of water. We had a certain railroad put in four sliding gauge cocks 24 inches long. We could extend them in and pull them out in the boiler any distance desired and on a road test, while No. 1 or the bottom tube, was submerged at all times, No. 2 tube showed a flutter of steam and water at an adjustment of 24 inches; that is 24 inches from the back head. The No. 3 tube showed water at 10 inches and steam at 13 inches. The No. 4 tube showed water at 4½ inches and steam at eight inches. These readings were taken while the experimental glass showed two inches of water. What I mean is that these water glasses we had connected so that we knew they were showing the proper height of water, and while they showed two inches in the glass, the column gauge cocks one gauge, and while the four gauge cocks in the back head registered full water.

We had another test made on another railroad in the West and went into the matter extensively, the company continuing the test after we had finished, because they wanted to know the truth, and they found just a little worse condition than we did, and that was due to the light feed water they use.

So we went to another railroad, and we had them put sight glasses in a small locomotive boiler. We made a suitable connection and inserted a heavy glass tube through the wrapper sheet down into the water space, containing an electric light, so that we could actually see what was taking place in this boiler while under pressure. The main rods were disconnected and the valves opened to the exhaust so that we could operate the throttle at will, creating the same condition in the boiler as when the locomotive was being operated in service. A total of 11 sight glasses were inserted.

By opening the throttle slightly we got a general rise of water about one inch or 1½ inches over the entire crown sheet. That would be registered by the water glass. By opening the throttle wide, the roll of water was increased to about four or 4½ inches in height, which was registered by the gauge cocks but not by the water glass; and this, we believe, demonstrates why the gauge cocks invariably show or indicate more water in the boiler than the water glass, and yet all of us have told the student engineer, "When you want to know where your water is, try your gauge cock."

When you have gauge cocks connected directly into the boiler, you are releasing a certain amount of pressure when you open the gauge cock and that would have a tendency to raise the water and draw some of it out with the steam. The water glass, if properly applied and kept clean, the cocks free from obstruction, will register the general level of water in the boiler.

We believe a properly designed column will register the general level of the water in the boiler. It won't do to put any kind of a column on. If the column is small and the top and bottom connections have the same internal diameter opening, the water can be syphoned or raised from the bottom to the top of the column by opening the top gauge cock wide and leaving it open for a second or two.

Generally speaking, the internal diameter of the column should not be less than 2½ inches. The top connection should not have a mean internal diameter of less than 1¼ inches and the bottom not more than ¾ inch opening into the boiler; the gauge cocks should not be over ¼ inch, and care must be taken to avoid all sags or pockets in the piping to both the column and water glasses. One water glass should be attached directly to the column and the use of valves in the top or bottom connection to the column should be avoided.

THE PRESIDENT: Come to order. We will now have the pleasure of listening to an address by Mr. W. H. Bremner, President of the Minneapolis & St. Paul Railroad.

ADDRESS OF W. H. BREMNER.

Mr. President and Members of the Master Boiler Makers' Association:

I owe you an apology. I understand that the proceedings were delayed this morning a little while waiting for me. Well, I was here at 9:30. The letter inviting me to address you said to be here at 10 o'clock. I have it in my pocket, so there can be no mistake about it.

When I received the invitation to address this association, about a month ago, I determined that I would try to talk to you about something pertaining to your duties, about which I know practically nothing. So I borrowed from one of your good members a copy of your last year's proceedings. I looked over the subjects discussed, and I ran across a subject that ran something like this: "The Advantage of Using Oxy-Acetylene Flame to Cut Staybolts, as Compared with the Old Methods of Nippers," and something else: and then I found such subjects as "crown sheets" and "draft appliances," and I knew that if I attempted to talk on any such subject I would be in the same position as an engine that was returned to one of the railroads of the Northwest. (Laughter.) (I am not mentioning any names.) The boiler had become so defective, not through any fault on the part of the boiler makers, that under the rules promulgated by the Interstate Commerce Commission, they had to reduce steam to a point where when the engine was running it would not whistle, and when it was whistling it would not run. It had to stop at every railroad crossing.

If I attempted to talk to you on any one of these subjects, I would be in just the same position. I could not talk while I was thinking, and I could not think while I was talking; so I concluded that all I ought to do was to say to you on behalf of the railroads of Minneapolis and St. Paul, that we are very, very glad to have you here, and to say on my own behalf, and on behalf of my own railroad, that if there is anything we can do for you while you are here all you have to do is to call on us.

I take it that this is the first convention since the return of the railroads by the Federal administration. You gentlemen, up to March 1st, were all employees of the United States Government, the same as myself; but you are now employees of the individual railroads. With respect to your duties to your employers there is of course no line of demarkation. You owed the same duty to the Government that you now owe to the individual employer, and undoubtedly will perform that duty in the same way.

In looking over the minutes of your last convention I was impressed by one thing. I read all of the addresses. I thought maybe I would get some ideas. Three of the speakers at your last convention talked to you along this line: that a railroad could not run without a locomotive; and that a locomotive could not run without a boiler; and therefore the master boiler maker was the whole thing on the railroads.

Now, I am going to let you fellows say that to yourselves. I will admit you are mighty important: but you are not the whole thing. (Laughter.) It is just as important that the section foreman perform his services, his duties, properly and well, that the car repairer do his work well, as it is that you perform your duties properly. In other words a railroad is made up of a great number of individual parts—a great number of individual employees—and every man no matter how minor his part, has an important part in the railroad machinery; and when any one cog fails the whole machine may fail. I say that because I don't want you fellows to get your heads swelled because of what was said to you last year. I will admit you are very important, but there are others who are also important.

Yesterday I picked up a little pamphlet sent out by some firm as an advertisement. It gave a little history of the early railroads. We are all of course familiar with the wooden rails, the coaches that were nothing but the old stage coaches with flanged wheels attached: and then next came the combination of railroad and canal, where they loaded the merchandise on canal boats—took it part way by canal and then pulled the boats up on flat cars, and then the canal boats were put back in the water again. And by successive stages out of that small beginning has come that great system of railroads of which we are all so proud, the like of which there is not anywhere else in the world—nothing that will begin to compare.

And you know gentlemen, the one thing that has permitted the immense growth of this country, is the railroads. Without the railroads there would not have been any West; we would not be meeting here today probably.

And now those roads have come back to us under-equipped. I am not blaming the Government. Don't misunderstand me. We were confronted by conditions which required that the energies of the Government be turned in other directions. They are under-equipped, and it will be years before they are again fully equipped. I was looking at a report of the Interstate Commerce Commission yesterday, in which it was said that there are needed now—not next year or the year after that, but *now*, 2,000 locomotives, something like 300,000 or 400,000 cars, and so on. We cannot get those this year, gentlemen. That is out of the question. We may get a few of them along in the latter part of the year. So it is up to you to see to it that your portion of the locomotives that we do have is kept in as nearly 100 per cent. condition as possible. It is up to every other employee of the railroad to do his best to keep what equipment we have up to 100 per cent. condition, so that we can give to the public the best service possible with what we have. We cannot hope for new equipment to any considerable extent. We must do with what we now have on hand.

I have been very much interested in the talk of the previous speaker. In fact I was so much interested that I forgot that I was to address you. The thing that impressed me in connection with his talk was, that apparently there are so many accidents which might be prevented with just a little more care. Every locomotive that is put out of commission to that extent reduces our efficiency. Now every accident is not due to the boiler. Probably only a very, very small percentage of accidents are due to boiler failures; which is to your credit. But every man on the railroad should now above all things be careful in his work, careful in his inspection, that engines and cars shall not have to frequently come back to the repair shops.

I do not like to talk about my own road, but just to show you what we are having to do now with power—we have some 20 of our heaviest type of freight locomotives. In February, 16 of these locomotives were in service and the average number of miles made by each in that month was 4,000. Four thousand miles in a month of 29 days with four Sundays and a holiday! In order to keep up that sort of record we must be careful with the work in the repair shops when the engines come in.

I have talked longer than I intended, and I know you want to get down to work and talk about flue sheets, and the autogenous welding with which the gentleman who preceded me did not seem to be much impressed; and I cannot talk about such things intelligently. I thank you, gentlemen.

EXPLANATION FROM THE SUPPLY MEN.

The Secretary: The Secretary has been asked to present the following communication from the Executive Committee of the Boiler Makers Supply Men's Association:

The Executive Committee of the Boiler Makers Supply Men's Association wish to express in behalf of their Association to the Master Boiler Makers' Association their regrets and disappointment on account of their not being able to make an exhibit at this meeting, and believe that a statement of the difficulties which prevented the making of such an exhibit will be of interest to the members of your Association.

At a meeting of the Executive Committee, held early in the year in Chicago, it was decided to make an exhibit at this Convention, and the officers were so instructed, and a Committee of three was appointed to visit Minneapolis and complete preliminary arrangements. This Committee did so and returned with a favorable impression of the situation, but when the available space for exhibits which consisted of the sun parlor, approximately half of the hall in front of the Assembly Hall, and the spaces on both sides of the stairs in the lobby was laid out into exhibit spaces, and proper allowance made for aisles and entrances, we found that there were only thirty-four (34) spaces seven by seven. Inasmuch as there were one hundred and forty-five (145) such spaces and twelve (12) rooms required to take care of the exhibits at the last convention, it will be evident that an attempt to take care of the situation with less than one small space for each member of our Association would be an impossibility.

It was then decided by the Committee, after careful consideration, the making of an exhibit was impossible and the only alternative was to allow members of the Supply Men's Association to make exhibits in their rooms. The conflict of dates with the Fuel Convention, the difficulties of getting exhibits from Minneapolis to Atlantic City in time for the Master Mechanics and Master Car Builders' Convention have prevented many firms from having such exhibits in their rooms.

We trust that the difficulties surrounding this situation will be clear to and understood by all, and hope that in the future that conditions will be such that the Supply Men's Association will be able to greatly enlarge and improve their exhibits as compared with the past.

EXECUTIVE COMMITTEE,
BOILER MAKERS SUPPLY MEN'S ASSOCIATION.

CHARLES B. MOORE, President.
B. A. CLEMENTS.
H. S. COVEY.
GEORGE R. BOYCE.
JOHN P. MOSES.
FRANK J. O'BRIEN.
S. F. SULLIVAN.
GEORGE P. SEVEY.

THE SECRETARY: In view of statements made in the annual report of the Secretary, the Executive Board wishes each member of the Board given the names, the company or railroad connection, and the amount due from each delinquent.

The Board thought that possibly delinquents might be present who did not understand the situation: that they would not care to have their name go before each individual member of the Board, as the Board contemplates placing in operation a method expected to induce payment of arrearages and to increase attendance of members of the Association at conventions.

Will delinquents, if any are present, oblige the Board by taking notice, and if they do not want their name to come before the Board as a whole or as individuals, be sure to visit the registration booth and put themselves in good standing. (Applause.)

THE PRESIDENT: Gentlemen, we will now come down to solid business on the topics that will be before the house for discussion. We want each and every one to say something. Give us what experience you have, so that we will have good solid information to take home. I believe all who are here wish to be benefited. The first subject before the house is,

"What is the Best Type of Washout Plug, Arch Tube or Hand Hole Plate, to be Used in order to Overcome Leaking, when Boiler is Under Pressure? Kind of Thread, Number of Threads per inch and Taper per Foot?" Mr. Charles P. Patrick is Chairman, with John J. Orr and W. H. Laughridge on the committee.

THE SECRETARY: Mr. Patrick has asked your Secretary to continue employing his lung power by reading this report. The Secretary's understanding with Mr. Patrick is that the committee is divided, and unable to harmonize their differences of opinion. He presents as a report the following:

BEST TYPE OF WASHOUT PLUG.

Chicago, Ill., May 14, 1920.

Mr. John J. Orr,
Mr. Wm. H. Laughridge.

Gentlemen: The question understood, means what is the best washout opening device to tighten under pressure. This question involves other considerations which must be met. Accidents, expense and terminal delays to locomotives are to be considered with the subject.

The best device to overcome leakage when the boiler is under pressure is a good order brass plug having 12 threads to the inch and tapered three-quarters of an inch to the foot. These threads full in size, made on good material and four full good order continuous threads at least in the sheet. If these conditions are maintained, there will be but little chance of material leakage, and if leakages occur there is little or no trouble or danger in tightening a good order plug properly applied, which has from some cause or other not been made tight when the boiler was empty.

We cannot provide against neglect of sheets or plugs which cause failures and accidents. These conditions are controlled by the boiler inspectors and men in charge of this work.

If the threads on a plug are bad, or the plug allowed to be used after it gets a shoulder by which it is temporarily frozen tight, or the sheet allowed to grow thin to the extent it does not contain sufficient threads to hold the plug, or the threads bruised and battered so a plug will not tighten, an accident or engine failure may occur.

Also the brass screwed washout plug is the most economical washout opening device in use today, and there are no other removable attachments to the boiler that give less trouble, or cause less accidents.

Yours very truly,

Charles P. Patrick, Chairman.

Scranton, Pa., May 12, 1920.

Mr. Charles P. Patrick, Chicago, Ill.

Dear Sir: Under separate cover I am sending you one of our Company's blueprints No. 4-A-1114 showing the disposition and number of washout plugs on our locomotive boilers. This, with the other blueprints, you will note indicates the type, size and kind of plugs used, number of threads per inch and taper of threads per foot. This, I believe, is considered generally good practice on railroads.

I am also sending you a blueprint sketch of hand hole plate which, in my opinion, may be used advantageously in the place of corner plugs in front and back corners of a backhead and throat sheet, and whose advantages lie in the use of a somewhat enlarged clean-out hole in the absence of threads which are ordinarily injured when the boilers are properly cleaned. This provides the enlarged hole for greater ease in cleaning, and the absence of threads facilitates the work so that the boiler cleaner need not fear the injury of the threads, which is ordinarily the case with screwed-in plugs.

I believe this device is easier to maintain, and if properly applied, no leakage will occur. In using these hand hole bolts, better results are secured in the washing out of the boiler because more room is given to the workman for removing broken parts, and the corners are equally more accessible. It is handy for boiler makers at enginehouses to remove broken bolts in staybolt renewals. I have known of many cases wherein boiler makers have spent from six to eight hours removing broken bolts from water spaces through washout plugs which are too small for practical purposes in such work; for my part, I recommend the hand hole plate in the water legs of all locomotive boilers instead of corner plugs for the above reasons, and because they are safer and more economical in the long run.

As an arch tube plug, the plugs opposite the open ends of arch tubes in the outer walls of the boiler sheet, I recommend a plug illustrated by enclosed pamphlet. This is a hand hole cover flange applied to an oblong hole and inserted into the boiler through this hole and applied from the inside. This flange is intended to be applied to locomotive boilers on the back head and throat sheets and is more particularly advantageous when applied opposite arch tubes. It affords a minimum restriction to circulation in this location where the circulation is most severe. This form of plug is superior to the usual brass plug and ball joint arrangement applied in some cases at this particular joint, inasmuch as plugs blow out when applied cross threaded. This same thing happens to the ball joint when the holding studs are overstrained so as to crack and break often causing serious personal injury to the cab operators, and on account of such possibilities this has a decided advantage. It is absolutely safe against injury from blowing out.

Furthermore, the oblong hole required for this form of cover affords better opportunity for inspecting, rolling and beading over the arch tube ends. This cover is especially designed to withstand severe strains required in boiler service and when properly applied is free from leakage and from injury account of blowing out as it cannot be blown out without the sheet to which it is applied first giving away.

By this device one gets away from the maintenance cost of retapping the sheets and rethreading the plugs which is necessary when the screwed-in plugs are used. It is a decided safety device and one which is economical in use. We have a number of engines on our road equipped with this plug and it is found to be entirely satisfactory in all respects.

Yours truly,

JOHN J. ORR,
General Foreman Boiler Maker, D., L. & W. R. R.

THE SECRETARY: Now gentlemen, don't forget to give your name, and the road or company with which you are connected, before you speak. And give the Secretary an opportunity to repeat it to the stenographer. Otherwise you are liable to be interrupted.

DISCUSSION.

MR. T. P. MADDEN: It is my belief that very few locomotive boiler makers today have had much experience with a hand hole plate. I worked in marine and contract shops a number of years ago and we had a great deal of trouble keeping hand hole plates tight. I believe that some men here could give us information along these lines. This matter should be thoroughly discussed. As the committee has made a divided report we should without hesitation express our opinion as to which is the best plug to adopt.

Mr. W. J. Murphy: I have had considerable experience with both the threaded washout plug and the hand hole plate as described by Mr. Patrick. With the threaded plug there is danger of the threads becoming crossed. These plugs in a very short time develop a shoulder at a point where the plug tightens in the hole, and, in time, by constantly removing and replacing, the threads become stripped. This condition requires very close inspection, and very often, unfortunately, is due to the inferior class of labor it is necessary to use in these days in washing boilers; we do not always get the proper inspection of these plugs, and where any one of the plugs is so defective, there is danger of it blowing out without a moment's notice, very often with serious danger of loss of life. On the other hand, with the hand hole plate as described by Mr. Patrick, it is absolutely necessary to have the proper joint; if the proper joint has not been made and the nut not pulled tight, the thing will begin leaking while the boiler is being filled with water and before the locomotive is fired up. By this we have an opportunity to make it tight and safe before there is any pressure on the boiler. It is my opinion that the hand hole plate is far superior both from a maintenance as well as a safety standpoint, to any threaded washout plug that I have even seen.

Mr. H. J. Wandberg: My experience goes back a few years in railroading. All our old locomotives are equipped with hand hole plates at the bottom. We patched them up about 20 years ago, and have ever since used the brass plug, which we found was a great deal easier to maintain, and has given us good results. There is absolutely no danger with a brass plug, providing it is properly applied. My recollection goes back to a time when we had a serious accident with a hand hole plate. Through some cause a bolt broke and the hand plate came out and scalded a brakeman. This is ancient history—something like 25 years ago—and is one of the principal causes of our adoption of the brass plug.

I would like to hear from as many here as possible as to the exact taper of a plug to be applied. Our present standard is three-quarters of an inch to the foot. I understand there are a greater number using a one or a one and one-quarter inch taper. I believe that with a little larger taper the plugs would last longer owing to easy removal. A brass plug one and one-half or two inches long with a three-quarter inch taper is practically straight. We screw them in too tight, and the brass being softer than the steel we form a shoulder.

Much is said about the graphite forming on the plug, which it does; but I have found a number of plugs that have been applied to light sheets, say five-sixteenths or three-eighths, where the plug has been put in so tight it reduced the plug, and it is very hard to remove, when it is necessary to apply a new plug to get a good job.

Mr. C. E. Elkins: On our road we use a plug with a taper of one and one-quarter inches per foot. I believe that is better than an inch or three-quarters of an inch to the foot, because a three-quarter inch taper will shoulder quicker than one of one and one-quarter inches. If the plug is made of the proper thread, one and one-quarter inches is about the proper taper. We have been using that design for a number of years, and never experienced any difficulty. It is far superior to the hand hole plate. The people that handle washout work are not mechanics. The washout plug is far superior in every way to the hand hole plate we used 20 or 25 years ago on all railroads.

Mr. B. C. King: I recall the time when we used the hand hole plate in this country. Two years ago, in Siberia, they used a brass bushing one and five-eighths inches, and a copper gasket when they could get them; and when they could not they used leather. I saw a great many engine failures over there. They were held up 50 per cent of the time by leakage from the hand hole plates. It was necessary to remove the brass bushing, the opening not being large enough for a cleaner. On the Northern Pacific we use a brass plug with a taper of one inch in 12, which is very satisfactory, and we have very little trouble.

Mr. George Austin of Topeka: Like some of the older men, I had a lot of experience early in life with hand hole plates. On our road we have about 2,200 locomotives. I should say that the average number of screw plugs in these locomotives is 30, which will amount to about 66,000 plugs.

These locomotives are washed out on an average of 10 times a month. That is from 600,000 to 700,000 plugs a month to go over. I believe we can remove a washout plug and replace it in less than a minute and a half. I don't believe you could remove and replace a hand hole plate in five minutes even with good luck; therefore the time loss due to hand hole plates will be very great.

If a railroad is so unfortunate as to be afflicted with feed water very heavily charged with incrustating solids, and large openings are necessary to remove scale, a hand hole plate might be best; but that is not our condition, and I personally am not in favor of changing to hand hole plates of any kind.

Mr. Charles E. Hagan of Western Indiana R. R.: For a number of years I have been associated with several roads, and am thoroughly familiar with all of their standards. In my opinion the brass plug, properly tapped into the sheet, with a 12 thread, three-quarters of an inch to the foot, will give better service with fewer failures than any other.

The Secretary: Mr. Patrick presents the following information concerning plugs, arch tubes and washout:

Information Concerning Plugs, Arch Tube and Washout.

There is no general data concerning the locomotive more complete and reliable than the records in the annual reports of the Chief Inspector of Locomotives of the Locomotive Inspection Department of the Interstate Commerce Commission.

As to accidents chargeable to these plugs, we have the following record:

"We have 69,000 locomotives coming under this department. During the preceding years the accidents from plugs, arch tube, and washout are as follows:

13 in 1912
20 " 1913
21 " 1914
16 " 1915
17 in 1916
8 " 1917
14 " 1918
30 " 1919

making a total of 139 accidents from all causes during the last eight years, or an average of 17.3 per year. We will call this 18 accidents per year.

"Assuming 40 per cent of these locomotives, or 27,600, are equipped with arch tubes, and the average number of plugs in each boiler is 25, in detail located, one in each corner of the lower legs, is (4), one in each side of lower legs, is (6), one in the throat sheet, is (7), one in the vicinity of fire doors, is (8), three above the crown sheet in back head, is (11), two each side of the upper wrapper sheet to clean the crown, is (13), one just ahead of back flue sheet in connection sheet at top, is (14), one in the vicinity of check valves, is (15), two in bottom of barrel of boiler, or in front flue sheet, is (17), and an average of eight arch tube plugs, making 25 plugs all told, or a total of 690,000 plugs.

"We have remaining 41,000 locomotives without arch tubes, therefore have 8 plugs less, or 17 to the locomotive, or 703,800 plugs, or a grand total of 1,393,800 plugs.

"Some water conditions only necessitate removal of these plugs once a month, while the other extreme in bad water, or where the water has been heavily treated with soda ash, 10 removals per month are made. However, to be on the safe side, we will take an average of two washouts per month, which means 33,451,200 washout plugs removed each year. As before stated, we have an average of 18 accidents per year, or one accident for every 1,858,177 plugs removed.

"There is really no reason whatever to be alarmed about accidents from washout plugs. They are the safest device I know of on a locomotive boiler, considering how often they are handled.

"And it is also my opinion the cheapest device for stopping up a hole in a boiler which has to be unstopped and restopped from one to ten times a month."

The President: Gentlemen, you have heard the reading of the committee's report. It is very complete. Mr. Patrick's remarks are certainly what we would term common sense and good advice and counsel. With the plug properly applied there is nothing better; but if not, then what? Like any other part of the boiler, if it is not properly done, why it is wrong, and it is serious. The object of the various designs of washouts is to overcome the conditions some careless person has brought about. So I would like to hear an expression from all who have used different kinds of washouts. Any further remarks?

Mr. D. A. Lucas: I can only speak from past experience. I go back 35 years when all locomotives had hand hole plates. Trouble experienced caused almost every road in the country to abandon them for the washout plugs. No device is more simple, or any nearer fool-proof, than the common washout plug.

You have one joint to thread or one hole to tap with; a proper tap and one joint to make, by screwing in a washout plug, whether of brass or some other metal. The old washout plug with a good thread, and a good thread in the sheet, and a good thread on the plug, is the safest and best device that has been found for closing that hole and for being removed as it has to be from time to time, and stand up under the stress. I am in favor of a good thread in the sheet and a good standard washout plug.

A Member: What taper?

Mr. Lucas: I would prefer the one and one-quarter taper. It is the best in all cases. If a three-quarter inch taper to the foot is used, the plug is nearly straight. From an economic standpoint more plugs are necessarily used because they can be screwed in so much further every time. With a one or one and one-quarter inch taper the plug lasts longer and is a good job with 12 threads to the inch. When the sheet is tapped and the plug made the same taper it does not have to be made so tight to get a good tight job.

Mr. Frank Yochem: I believe we have a certain number of difficulties to overcome in applying facilities for washing boilers. In a great many places a plug can be applied where a hand hole plate would not be practicable; for instance, close to a knuckle or between staybolts. Where a hand hole plate is to be applied to an irregular shape (not a flat surface), you may not have a hand hole plate that will pull with the bridge up tightly to the sheet, and after the engine is fired up the gasket will be blown out. More trouble will be had with leaky hand hole plates than with leaky plugs. I am in a bad water district. Every other day a locomotive has to be washed out.

Mr. B. F. Whalen: The washout plug proposition is broader than many understand. In our locality a majority of the roads use different methods in doing their work. The boiler maker puts the hole in the boiler; the machinist will tap the hole; give him the size of the plug on a tap, and on the lathe he will take over the plug and fit it in the hole.

The boiler washer washes the boiler, and, as a rule, is an unskilled man. Many foreigners are being employed down our way on such work. He will put the plug in. The boiler inspector is responsible for the job. Can he vouch for the job from start to finish?

When I first began railroading they had a number of engines with hand hole plates and experienced a great deal of trouble in hard water districts from such plates. I have seen them pulled up tight when cold, and after the pressure on the boiler was up to the working point the nut could be turned with your fingers. Whether all could be caught before the engine got out was uncertain. Consequently a leaky gasket would develop, or a leaky plug. Science and progress have advanced, and I believe they are getting away from that. Then came the brass plug: it was called a "universal" plug, practically over the country. The washout plug is something on which there has not been improvement in keeping with other modern devices; the brass plug is still in use—12 inch thread, three-quarter inch taper.

Boilers are washed at night after the shops are shut down. The boiler washer will take out a plug that is corroded, put it back and pull it up against the shoulder of the graphite. He probably has injured the thread in washing that boiler. Maybe the engine will go out before daylight; maybe it will get away without the inspector catching it. You don't know whether the plug is in an O.K. condition or not, or whether it is pulled perfectly tight.

One year ago last January we installed a safety washout plug on our 10-wheel passenger engines and we don't know that the washout plugs are in the boiler as far as trouble is concerned. Not one has been removed, not one has leaked. You can't cross thread them. No threads are accessible to the rod with which the boiler is cleaned. It is protected with a shield. I understand 35 different railroads in the country are testing this plug, and I saw a telegram last Saturday ordering 600 at once for the American Locomotive Company. The brass plug is easily cross threaded. The greatest number of accidents I believe on 19 railroads was due to inferior washout plugs being put in.

As far as the hand hole plate is concerned, I believe that it is like driving a rivet by hand and cutting it in with the riveting hammer: it is a past issue.

Mr. Madden: I take exception to the remarks of Mr. Whalen. He states that we pick up anybody and everybody to wash out boilers—men so incompetent that they don't know how to apply a plug. When a new man is employed as a boiler washer the first thing done is to instruct him in applying a washout plug. Otherwise he takes his life in his hands. I object to Mr. Whalen's statements going into the minutes; they are a reflection on all of us.

Mr. Whalen: I don't wish to reflect on anybody. Before I sought to speak I heard it remarked, "The boiler washer is an incompetent man." We watch him. We do our part and watch our boiler washers. But you can't be with them every minute to see what they do. I feel they are not mechanics, and they do jobs that get away without the boiler inspector or the foreman seeing them.

Mr. John O. Crites: Last week on the Schuylkill division of the Pennsylvania a passenger engine was washed and the boiler made ready for pressure. Before we had 150 pounds pressure the washout plate on the right hand side of the firebox gave out. It leaked so badly they had to let the water out, put in another gasket, and make a second trial. Before the full pressure was on it gave out on the left side, and we had to repeat the operation. I am certain that if a plug has the same taper as the thread on the sheet, and a good thread, absolutely it will be tight. When a plug is put in all a man has to do is to unscrew a thread or two and see that it is not cross threaded. If it is put in properly with graphite, it is not going to leak. I certainly favor plugs and not washout plates.

Mr. F. J. Jenkins: On our railroad we have the light Mikado and U. S. Standard switch engines, and Pacific type passenger engines. All are equipped with arch tubes. A great deal of trouble was experienced with arch tube plugs leaking in the throat sheet, due to the plugs being improperly designed, with short taper square for applying them. This trouble could not be remedied until they were made with a long square shank without any taper so that they could be properly applied and removed without damaging threads on plugs and in sheets. The best and most economical washout plug, according to my judgment, is one threaded 12 threads to the inch and one inch taper in 12 inches. If plugs are made in this manner and designed so that they can be pulled in sufficiently tight, they will not leak and there is no danger of their blowing out and causing injury to persons working around the engine. In nearly every case accidents caused by washout plugs blowing out are the result of plugs being improperly applied, which causes them to leak. Also the roundhouse foreman being overanxious to get an engine into service insists on their being tightened while the boiler is under steam, which in no case should be done.

On motion of Vice President Lewis the discussion was closed.

The President: The next subject before the house is the tensile strength of firebox steel in actual service test. The Chairman of the committee is Mr. W. J. Murphy, with J. F. Fernstrum and Lewis Eberle his associates.

REPORT OF COMMITTEE ON

"Topic No. 2"

"What Firebox Steel Gives the Best Results from Actual Service Tests, Steel Having a Tensile Strength of from 48,000 to 58,000 or 55,000 to 65,000 Pounds per Square Inch?"

Your committee has endeavored to make the report on the above subject as brief as possible. In gathering this information we find there is a very slight difference of opinion, or rather a slight difference in the specifications of the various railroads, for firebox steel.

The members of your committee have given considerable attention to the care of locomotive boilers, including the study of failures of firebox sheets.

In general firebox sheets fail in one of two ways:

First: Gradual Failure: The sheet may have a good many small cracks which are mostly in a vertical direction. These cracks are thickest radiating out from the staybolts and frequently run from one staybolt to another in the same vertical row, but never between staybolts horizontally. These cracks are almost always on the fire side and at times extend through the thickness of the sheet, first going through next to the staybolts. Such sheets are almost always accompanied with more or less corrugation and the cracked and corrugated condition is almost always confined to the lower half of the sheet.

Second: Sudden Failure or Rupture: The sheets may fail by a single crack or rupture from a foot to several feet long. In bad cases the crack may extend from the mud ring to the crown sheets, but ordinarily, the cracks are confined to the lower half of the sheet, extending upward from the mud ring or from a few inches above it, and it is always near the middle of the side sheet longitudinally. Such sheets may show no corrugations and may show very little if any, other defects.

The failures of the first kind are of gradual formation, but those of the second class occur suddenly.

The records on file of one of the largest railroads in the United States show that between the years 1886 and 1913, 115,000 tons of boiler and firebox steel were used on locomotive boilers and they do not have any record of any failure that resulted in injury to persons or loss of life due to the character of the material.

This same railroad in 1892 specified and adopted firebox steel with a tensile strength of 55,000 to 65,000 pounds per square inch, and they are using the same grade today.

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It is the opinion of your committee that the life of the firebox sheets does not entirely depend on the specifications or tensile strength of the material, but rather on the care and treatment to which the plates are subject; for instance, the washing of boilers with cold water before boiler is properly cooled down; second, using the injectors when active steam production is not going on.

In conclusion, from the best information this committee was able to obtain, firebox steel with a tensile strength of 55,000 to 65,000 pounds per square inch gives the best results.

However, would also add that it is our experience that long life of fire steel is to be obtained by suitable treatment of water supplies, a proper arrangement for delivering feed water into the boilers and proper methods of caring for boilers in the engine houses, and elsewhere long life can be expected with most any grade of firebox steel.

W. J. Murphy, Chairman
J. F. Ferrestrum
Lewis Eberle

DISCUSSION.

The Secretary: Members having been provided with the report in printed form the Secretary suggests following former practice, the Chairman briefing it and the convention then proceeding to discussion.

On motion of Mr. Madden it was so ordered.

Mr. Murphy: Having no word from my associates the report was compiled from my personal experience.

Mr. Madden: This is a very serious question, many railroads having different specifications for tensile strength. On the road with which I am connected we use 55,000 to 60,000. The committee should be commended for the thought and labor given to the preparation of the report.

Mr. R. C. Gibson: My experience is that firebox steel with a tensile strength ranging from 50,000 to 56,000 pounds has always been the most serviceable.

The President: On our lines we have 55,000 to 65,000 hand hole plates, and get very good results. We also have a very large number of plugs, which when properly applied cause no trouble.

Mr. W. J. Murphy: Our specifications provide for 12 to 30 per cent carbon. For other parts of the boiler a harder steel is used, and, as my report states, we get very good results. Few firebox failures are due to tensile strength of the steel. Improper care of locomotives when on ash pits or in engine houses for boiler washout is the chief cause. The great importance of this question calls for thorough discussion.

MR. FRANK YOCHEM: We use 50,000 to 55,000 tensile strength. If staybolts are properly applied in the fire line tensile strength does not enter into the merits of the question. It is our experience that staybolts improperly applied in the first instance and getting loose are responsible for cracks. Constant driving of staybolts develops checks around their sides which eventually increase in length and a rupture of the sheet follows.

MR. JOHN F. RAPS: The Illinois Central specifications covering firebox steel required a tensile strength of from 55,000 to 65,000 pounds, the majority of the steel received having a tensile strength of 60,000 pounds. Having a great deal of trouble with cracked sheets I conceived the idea of firebox steel with a lower tensile strength being more ductile, thereby giving less trouble due to cracks. Accordingly the tensile requirements in the specifications were changed from 48,000 to 58,000 pounds. The life of our firebox sheets was very materially increased until about 1915 when the steel companies refused to furnish steel in accordance with our specifications.

MR. PETZINGER: We use 55,000 to 58,000 tensile strength. In the past ten years we have had three different grades of firebox steel. All our flanging is done cold. I find that all steel gives way in about the same part of the firebox. We have trouble with the flue sheet, the top knuckle giving way, which is probably partly due to the welding of the flues. The life of all firebox steel is about the same.

MR. WHALEN: We use 50,000 to 55,000. Since the war we have used different brands of steel. They are branded firebox steel, but some are better than others. Mr. Yochem said cracks around staybolts are caused by loose staybolts. I would like to ask him what causes a loose staybolt?

MR. YOCHEM: Improper application and water conditions. All facilities for washing boilers lower an engine. If you haven't a plant for hot water, cold water will do it.

MR. WHALEN: That is my opinion. In hard water territory loose staybolts will develop as soon as the boiler goes into service. I don't care how they are applied; the scale formation on the bolt around the thread keeps the water away from the plate and will cause pin cracks. The leak may be caulked but the cracks begin to creep and crawl. The washout system is another feature. Blowing off hot and filling with cold water will have a tendency to loosen staybolts. In the past year we obtained a firebox steel which, when a corrugation was made in a box patch or something like that, would crack in the corrugation. This was probably due to scale formation in the corrugation that cannot be reached unless there is a washout plug opposite to keep it perfectly clean. With a good grade of steel 50,000 to 55,000 pounds is all right.

THE PRESIDENT: We will close the discussion. The next subject before the convention is Topic No. 3.

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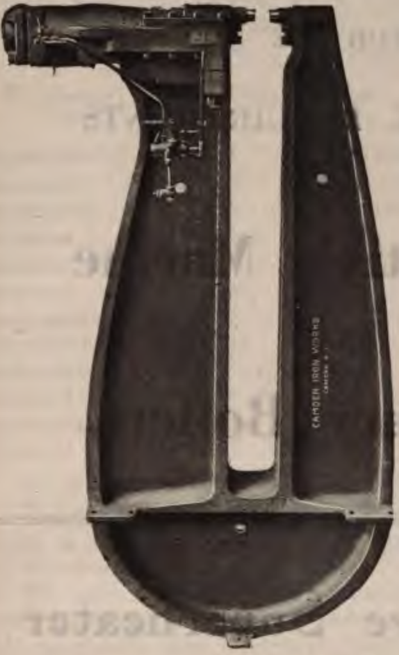

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REPORT OF COMMITTEE ON

"Topic No. 3"

"Is the Superheating and Reducing of Steam Pressure of Boilers Advantageous as to Staybolt Breakage Compared with Boilers of the Same Class not Superheated?"

We submit the following report for your consideration and discussion. The compiled data taken from six different territories or districts where the service, water condition, etc., differ largely and steam pressure is about the same:

DATA COVERING PERIOD OF FIVE YEARS

District Number	Number of Locos.	Steam Pressure	Total Broken	Bolts broken per year	Bolts broken per engine per year
Superheater........	5	185 to 200	127	25.4	5.08
Saturated..........	5	220	514	102.8	20.56
Superheater........	5	185 to 195	216	43.2	8.64
Saturated..........	5	220	710	142	28.4
Superheater........	5	185 to 200	1193	238.6	47.72
Saturated..........	5	220	1848	269.6	73.9
Superheater........	5	185 to 200	196	39.2	7.84
Saturated..........	5	220	1610	322	64.4
Superheater........	5	185	432	86.4	17.28
Saturated..........	5	220	470	94	18.8
Superheater........	1	185 to 200	71		
Saturated..........	5	220	358	71.6	14.32

All engines involved are Pacific type.

The chart shows there is no doubt that the superheater and reducing of steam pressure of boilers from 220 to 195 pound pressure will decrease the staybolt breakage.

We have also compared 10 locomotives previously operated as saturated without brick arch. These locomotives were later equipped with superheater and brick arch, and pressure remained the same—205 pounds.

The comparison shows considerably less staybolt breakage. (While this paper is not on the brick arch, we consider they are co-related and have some bearing on the subject.) The reduced breakage of staybolts is accounted for along these lines: The brick arch acts as an indicator making the proper handling of the boiler compulsory. If the boiler is blown down too soon arch tubes will be distorted. Saving the arch tubes also saves the staybolts.

Our records show that the Superheater and Reducing of Steam Pressure of Boilers result in a reduction of staybolt breakage.

T. L. MALLAM, Chairman
F. A. MAYER
E. J. SWEENEY

Mr. Sweeney, a member of the committee, called for the reading of a paper supplementing the report of the committee, whereupon a member moved that it be included in the Proceedings without being read.

THE PRESIDENT: Without making a comparison I judge that this report——

THE SECRETARY: Please permit me to clarify the situation. The Constitution and By-laws provide that the chairman of a topical committee shall receive the individual reports of his associates and then prepare a composite report for the convention, sending it to them for approval or amendment. It is further provided that individual reports cannot be presented to this body without its consent by formal vote. Every member of a committee was so advised specifically when notified of his appointment. The composite report on this particular topic was printed and mailed to members in advance of this convention and is now before you in regular and proper order. If a member of the committee wishes to present his individual report he cannot do so except by vote of the convention.

MR. RAPS: My question has not been answered.

MR. E. J. SWEENEY: The paper is one I sent to the Chairman of the committee, but we all reached the same conclusion—that the superheating of a locomotive is advantageous.

MR. JOHN F. RAPS: The paper submitted by Mr. Sweeney, as I understand it, is an individual report. According to the By-laws it should have been referred to the Executive Board for approval before being submitted to the convention, inasmuch as it was not printed and issued prior to April 1. At any rate it will be necessary to have the report read in order that the members may become familiar with its contents before it can be intelligently discussed.

MR. W. J. MURPHY: I do not understand how you can connect the cause of broken staybolts with the superheating of a locomotive. I believe you will agree that to get the real advantage of a superheated locomotive it should be given a heavy tonnage, or over-loaded; I do not believe this would have any effect on the staybolts, unless there is excessive steam pressure. I have had some experience with narrow or O. G. Firebox locomotives carrying a steam pressure of 225 pounds. We had considerable trouble with broken staybolts; also from staybolts becoming loose in the holes. As an experiment we reduced the steam pressure to 190 pounds and practically eliminated the staybolt trouble.

On motion it was ordered that Mr. Sweeney's paper be read. It was as follows:

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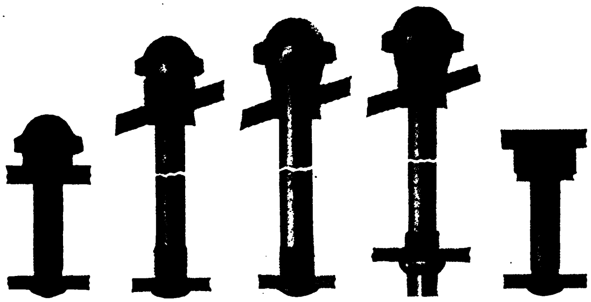

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The New York Central Railroad, in connection with the Pennsylvania, during 1910, made two elaborate series of tests and the results obtained showed that superheater locomotives decreased the demand on the boiler from 25 to 35 per cent, that is to say, the boilers of the superheater locomotives have to make considerably less steam than the boilers of other locomotives because, of course, with superheating, the cylinders of the engines consume less steam than before.

In line with the results of these tests, and my own experience, I contend that superheater boilers do not break as many bolts as boilers not superheated. We have in service on our road four O. G. Style fireboxes that are not superheated, whereas all our other engines are superheated. These four engines carry 200 pounds pressure; all the others carry 180 pounds. We find more broken bolts on the four engines than on any eight of our other engines that are superheated.

It is a question in my mind whether the fewer staybolt breakages on our superheater engines are the result of the lower boiler pressure or of other conditions caused by superheat. I think the superheater boilers do not have to make as much steam as the non-superheater boilers, and therefore do not have to be worked so hard, with the result that in the average superheater engine we do not punish the firebox sheets as much as we do in the non-superheater locomotives where on hard runs they trade water for steam. The lower boiler pressure of our superheater engines may help, but I am inclined to think that the greater advantage to the staybolt condition and other boiler maintenance conditions from superheat is that with the latter an engine can be more easily fired, and steam kept up more uniformly without having to fight for steam.

I think everybody appreciates the fact that staybolts are broken by expansion and contraction, which causes the inside and outside sheets to move with relation to each other. The harder and the more irregularly the boiler is forced the greater will be such movement and the greater the staybolt strain. Of course, I believe that the higher the boiler pressure, that is to say, the smaller the factor of safety is figured, the more a given strain is apt to fracture staybolts.

In conclusion I need hardly say that my decision, after giving this subject the closest study, is that a superheater boiler will not break as many staybolts as a boiler not superheated.

Yours very truly,

E. J. Sweeney.

The President: If you wish to discuss the subject, gentlemen, get at it because we have been delaying the work we have to do. This is a very interesting subject—something in which we all should be interested. I know that by reducing the pressure on a boiler we have just that much less on the staybolt, which therefore lasts longer.

DISCUSSION.

Mr. R. C. Gibson: It is not a question of superheated or saturated engines; it is just a question of being able to reduce the pressure by not superheating—that is all.

Mr. T. F. Powers: Mr. Sweeney's report mentioned four boilers of the O. G. type, and then deals with breakage of other boilers. Does he make comparison between the different types of boilers, or are the superheated boilers of the same construction?

MR. C. E. ELKINS: I cannot see any connection between the superheated and the saturated steam engines so far as the breakage of staybolts is concerned, if the same boiler pressure is maintained. If the steam pressure is considerably reduced it will tend to reduce the staybolt breakage. On the Missouri Pacific we reduced steam pressure as much as 15 pounds on some engines when the superheaters were applied and they showed quite a reduction in broken staybolts.

Someone said that they don't have to work the superheated engines as hard as the saturated. I don't agree with them as I believe the Transportation Department makes the engines do all the work possible, which is as it should be as the sole object of the engine is to haul cars. We have more broken frames now than we did on the saturated steam engines.

MR. E. J. SWEENEY: Mr. Powers asked me about the four engines I spoke of in my report. They are the only engines we have of the O. G. type and I find more broken staybolts on them than on any others on the line. We have 180 superheated engines on the Southern division in the Chicago district.

MR. LUCAS: Isn't it a fact that engines superheated and changed over reduce the pressure? On the Milwaukee all our superheated engines are reduced in pressure. We had pop set at 180 but they put them back to 200 pounds and when an engine is superheated they increase the tonnage as well.

MR. JOHN F. RAPS: I happened to be chairman of the committee that formulated these topics and am responsible for this one being included. Our General Superintendent of Motive Power asked me whether there was any difference in the breakage of staybolts as between saturated and superheated locomotives, the former carrying from 200 to 210 pounds steam pressure and the latter 180 to 185 pounds. As we did not have any locomotives that had been converted from the saturated to the superheated type a sufficient length of time to make an accurate comparison I decided to get the opinion of the various members, especially those having had more experience than we had with the converted locomotives.

The members in their discussion have been telling about the results obtained from cutting the steam pressure on the boiler. That does not mean very much unless everything remains normal. As a rule when a saturated locomotive is converted to a superheated locomotive the steam pressure is reduced from 10 to 15 pounds and the tonnage increased, and the tonnage is the answer to the broken staybolt problem. The more tonnage an engine pulls the harder it is strained and of course this causes a greater number of staybolts to break. Undoubt-

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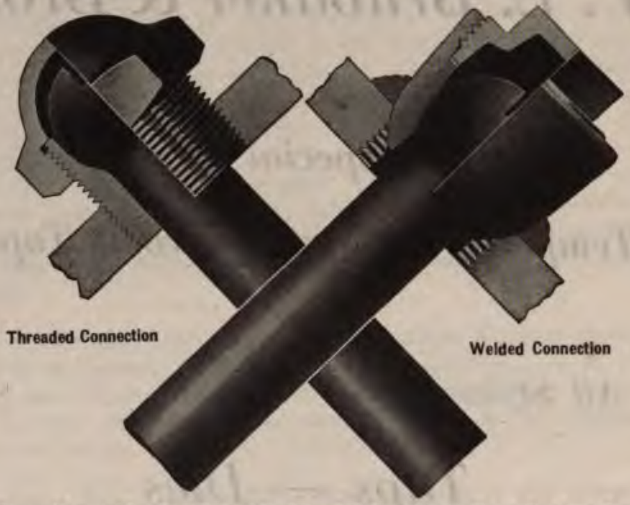

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edly the reduction of steam pressure on the boiler will be of some advantage when engines are superheated if the tonnage is not increased to the point where this advantage is overcome.

Mr. W. H. Evans: We have eight engines that are of exactly the same type, four having been superheated about three years. I have noticed the breakage of staybolts in them very carefully and I don't think there is a particle of difference. I know that the superheated breaks just as many as the saturated, because I keep a record of every broken staybolt.

Possibly some of the members who have spoken do not take into consideration the fact that when you superheat an engine you give it a general overhauling, and it therefore appears to have an advantage over the saturated. I can't see why superheating should prevent staybolts breaking because I believe it is a matter of expansion and contraction; and even though you reduce the steam you still have enough to break staybolts.

Mr. H. J. Wandberg: As far as the two types of engines are concerned, I don't see a particle of difference. We have several classes of engines that have been superheated, the pressure being reduced to 180 or 185 pounds, but since then increased to 200. Instead of being easier, they are no doubt harder on the boiler; but for all that I have seen no difference in the breakage of bolts. Most of our superheated engines are of a late type. Many come to us right from the builders. Others have received heavy repairs and new fireboxes in the shop; consequently our staybolts are all new. In making comparisons all boilers should be of the same age, type and length of service and used in the same service. Owing to bad water conditions we have more broken bolts on some divisions of the Milwaukee than on others.

Mr. T. F. Powers: Several elements enter into the breaking of staybolts besides superheating or reduction of steam. One is the geographical condition of the country in which locomotives run. I mean that vibrations will break bolts. For two reasons more bolts are broken on our lines west of the river than on all of our other engines combined; one, water conditions; the other, the geographical conditions of the country—that is, running up and down hill and being subject to frequent expansion and contraction. In that country the type of locomotive and the type of boiler, makes much difference; and the steam pressure makes some difference. Eight years ago we sent two engines there, each of which carried 160 pounds of steam. I believe we have a couple of men here who will verify what I have said. It is a district where it is nothing unusual to remove 40 or 400 staybolts at one roundhouse in a month. On these two engines we have not had broken staybolts during the last four or five years, and very few were broken up to within eight years. Water conditions—that is the life of a fire box—has much to do with breakage. An engine with a firebox seven or eight years old will break more bolts than one having a new fire box. I don't believe superheating locomotives has much to do with the breaking of staybolts unless you reduce the steam pressure.

Mr. W. J. Murphy: Do we not have fewer broken staybolts in wide fireboxes than in the narrow or O. G. type? That has been my experience. It is also true that the number of wide fireboxes superheated is greater than the narrow type. I believe close checking would show that the greatest number of broken staybolts will be found in saturated steam boilers.

Mr. John O. Crites: Saturated or superheated engines have little responsibility for broken staybolts. At Kane, in the Blue Ridge mountains, an inspector found 11 crown sheet bolts broken off completely close to the roof sheet in one of our L. I. S. engines that was only three years old. In my opinion breakage is largely due to water conditions and the material. If bolts are old high pressure will break them, but it is probably the consensus of opinion that expansion and contraction break bolts. We have some narrow fireboxes and have much trouble with them.

Mr. D. A. Lucas: In my long experience I handled many superheated and saturated engines and found that uneven contraction and expansion in the boilers was responsible for broken staybolts. One boiler will do it more than another with the same pressure owing to difference in design. If the theory of reducing the pressure from 200 pounds to 180 will eliminate breakage of staybolts, we ought not to have any in 140 pound boilers—but we did. So I have never been able to see any difference between superheated 180 and saturated 200—in the number of staybolts broken.

Mr. Thomas Lewis: I concur in what seems to be the general opinion that the design of the boiler has something to do with the breakage of staybolts. We have the narrow, semi-wide, and Wootten fireboxes. Our experience is that the first two break more staybolts than the Wootten. We also find the same condition in the life of the firebox. However, none of us can get away from the fact that a boiler carrying 210 pounds of working pressure is more liable to break staybolts than one with safety valves set at 180 pounds.

The object of superheating locomotives, as I understand it, is to economize on fuel; also to furnish cylinders with dry steam and, of course, at a higher temperature, which, in one or two instances I have in mind, where superheater engines were working at the same steam pressure as was in use before they were superheated, proved detrimental. After working pressure is reduced from 210 pounds to 200 pounds, and in other engines from 200 pounds to 195 pounds, or 180 pounds, it is

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natural to assume that the breakage of staybolts will be reduced. I believe that so long as we have locomotive boilers with the present design of rigid staybolts, whether they are superheated or saturated engines, we will have to contend with breakage, because fireboxes and boilers will expand and contract under steam pressure, and suffer abuse both on the road and at certain terminals. However, I like superheated engines because, in my opinion, there is less trouble with broken staybolts and they are more economical all around.

THE SECRETARY: The President desires you to be reminded of the rule that no member shall speak more than once on any given subject until all who wish to speak have done so. Its object is to give everyone a chance to talk, and members are urged to keep the rule in mind.

MR. JAMES T. JOHNSTON: I believe every member in this room will agree with me that it is not tensile strength that breaks the bolt; and it is not the temperature. At the high pressure, 225, the temperature is 396 degrees. Go down to 200, or to 180, and the temperature is 10, 15 or 20 degrees lower, and has nothing to do with it. I have got engines of 160 and 170 pounds, and I get more broken bolts out of them than I do out of the 200 pounds pressure, simply because the engine is working full capacity.

MR. WHALEN: Is not the breakage of staybolts due to the difference in the thickness of your sheets? The outside steel of some engines on our line is heavier than on others. We experience more breakage with the heavier sheets. Breakage of bolts is principally due to water conditions. We have very hard water in Indianapolis, and scale formation is so heavy despite the washing of engines, that no water at all gets through to the bolt. The bolts will snap out, the outer end of broken bolts is crystallized, and causes breakage. Unless a good flexible bolt is used breakage is inevitable. We have superheated engines running in practically hard water territory which, when put in soft water territory show fewer broken bolts. So I believe that as far as superheated and saturated engines are concerned it depends largely on the water.

THE PRESIDENT: Gentlemen, we will now close this subject and proceed to Topic No. 4, Frank H. Davison, chairman.

REPORT OF COMMITTEE ON

"Topic No. 4"

"Is it Necessary to Maintain the Cinder Hopper on Bottom of Smoke Arch of all Locomotives? On What Size Locomotive Should it be Maintained? Which is the Better Design to Overcome Air Leaks?"

From inquiries and observations made, your committee finds that the use of a cinder hopper on bottom of smoke arch is quite varied. There are roads that have some of their engines equipped with a hopper, and others not so equipped, and their performance is also varied; some engines with the hopper as well as those without it clean themselves satisfactorily and steam well, while other engines of the same class and type, having the same design and adjustment of front end appliance set alike do not perform as well, accumulating such an amount of cinders in the front end, that it is necessary to clean them out while on the road and away from terminal.

Your committee is aware of the fact that with some grades of coal the front end fills up to a greater extent than with other kinds, and to facilitate the removal of cinders the hopper is a convenience, if not a necessity. However, its use or non-use depends largely on local conditions, kind of fuel, and grade of coal used. We incline to the opinion that it is not necessary to maintain the hopper on oil burning, nor on coal burning engines that have front end draft appliances so designed, fitted and adjusted that they will clean themselves without danger of throwing sparks of such size and glow that they cause fires on the road.

Our inquiries further indicate that the foregoing also applies equally as well to the second part of the subject: "on what size locomotives should it be maintained?" and that the use of cinder hopper is about evenly divided between the larger and smaller classes of engines on the various railroads.

In regard to the third question of the subject, viz: "which is the better design to overcome air leaks?" we find there are a number of different designs used by the various roads. Some have hoppers with double nozzle lengthwise of smoke arch, others a double nozzle transverse with arch, and cover held in place by a bolt and spring between the nozzle, while on others a single nozzle with cover hinged so it will drop down, or one that opens to one side; again others use the single nozzle hopper, the cover being of wedge shape. As it is of great importance to keep the front end as free as possible from air leaks it is our opinion that the single nozzle hopper with cover plate fastened on each side is a better design.

FRANK H. DAVISON, Chairman
THOS. J. REDDY
JOHN L. WELK

DISCUSSION.

Mr. Frank H. Davison: With regard to the first question of the topic, the committee was of the opinion that it was not an absolute necessity; that it was a convenience. We could not say that it was a necessity on every locomotive because on many locomotives it is not used at all, while others could not get along without it. Therefore it is a convenience.

As to the second question, I do not personally believe that the size would be of much consequence. The question is whether it is a necessity, according to the conditions of the front end, and whether really needed in the territory, and the conditions governing where the engine is used.

As to the next question there are many different designs, but from my personal observation I believe that the single barrel nozzle, where single hoppers are used with a spring and fastened on both sides, gives the better results.

Mr. W. J. Murphy: On the road with which I am connected we have what is called a self-cleaning front end arrangement. The plates and netting are so constructed in the smoke box that the locomotive will clean itself thoroughly and it is not necessary to maintain a cinder hopper. When this arrangement is put in the cinder hopper is removed. It has been in use for a number of years and practically all of our locomotives are so equipped. It is true should a bad steam leak develop in the front end, such as a bursted superheated unit or a bursted flue—in fact any kind of a leak bad enough to affect the steaming qualities of the locomotive, it will also have some effect on the self-cleaning arrangement. It is not adjustable; it is built in stationary with a small door to permit inspection.

Mr. H. J. Wandberg: Our road has adopted as a standard what is known as the "Master Mechanic Self-Cleaning" front end. When a locomotive is so equipped we remove the cinder hopper but we apply a two inch washout plug in the bottom, so that the water can be turned out without running it through the flues. There is no occasion to maintain a cinder hopper on a self-cleaning front end.

Mr. W. H. Laughridge: It is so long since I had any experience with a cinder hopper that I could not tell you much about it. We abandoned it 27 years ago. We have no use for cinder hoppers, and I can't see how anybody else would if the engine is properly drafted.

Mr. C. E. Elkins: A number of years ago the Missouri Pacific adopted the self-cleaning front end and abandoned the old style cinder hopper under the smoke arch. At the present time we put in a two inch washout plug if we want to wash out the front end at any time, and it does away with all the trouble we had with burned front ends and leaky cinder hopper covers, and also makes a great improvement in the steaming qualities of the engine; we also have less trouble with leaky steam pipes and nozzles.

The President: Gentlemen, we will close this subject and proceed to Topic No. 5, Mr. R. C. Gibson, Chairman.

REPORT OF COMMITTEE ON

"Topic No. 5"

"Is the Flanging of Firebox Sheets on the Flange Press Detrimental to the Material? When can Cold Flanging be Employed to the Best Advantage?"

Your committee begs to report that the flanging of firebox sheets on a flanging press is not detrimental. It is a matter of the proper heating of the material

Cold flanging can be successfully employed on round heads and straight sides of flue and door sheets in all types of fireboxes.

Robert C. Gibson, Chairman

The President: You have heard the report of the committee. It is now open for discussion.

DISCUSSION.

Mr. W. J. Murphy: I cannot see much of anything in this question to discuss. I believe we will all agree that a very good flanging job can be done by the most modern flanging press method; nor can we deny that a fairly good job of flanging can be done by the old method, with the screw clamps and sledges. We must also agree that certain flanging jobs can be done with the steel cold as well as by heating, and that when heated it must not be too hot.

On motion of Mr. Madden the discussion was closed.

Mr. E. W. Young: In our haste this morning we neglected something of importance. I move a vote of thanks to Mr. Hall for his interesting address and illustrations.

Mr. Young's motion was carried.

Vice President Madden: It was the pleasure of the convention this morning to listen to an instructive address by Mr. W. H. Bremner, President of the Minneapolis & St. Louis Railroad. It was a credit to our Association to have Mr. Bremner with us. It should be very encouraging to our members as individuals to note that transportation officials are taking an interest in promoting the work of this organization. It is regrettable that Mr. Bremner cannot be present to personally receive the thanks of the convention, as I know that his remarks were fully appreciated.

The Secretary: All the speakers will get a copy of the Official Proceedings.

The motion was carried.

The Secretary: The absence of a printed report on Topics 6 and 7, which were consolidated by the President in naming a committee, is due to the fact that none was prepared.

Mr. Stewart, chairman of the committee, advised the Secretary at a late date that owing to the prolonged illness of his wife, whose recovery was not expected, he would not be able to attend this convention, and could not prepare a report. He asked that the President undertake to get somebody else to do it.

The President made that effort but without success. The subject is the first on the program for tomorrow, when Mr. Hempel and Mr. Austin will pave the way for discussion.

On motion the convention adjourned until May 27th at 9.00 a.m.

THIRD DAY

The convention reconvened at 9.00 a.m.

THE PRESIDENT: Gentlemen, we will have the reading of announcements by the Secretary.

THE SECRETARY: The committee on memorial to the late Mr. Fourness report as follows:

IN MEMORY OF THE LATE CHARLES E. FOURNESS.

The Master Boiler Makers' Association in convention assembled, at Minneapolis, Minn., May 25th, 1920, has learned with much sorrow and keen regret of the loss by death of Mr. Charles E. Fourness, one of the founders of this organization and an esteemed member thereof from its inception.

It desires to testify to the loyalty and devotion the late Mr. Fourness had always given to the Association and the efficient effort he had displayed in cooperation with his fellow members for its welfare and the advancement of the important craft with which he had been long and honorably identified.

The Association has lost a valued and valuable member and his associates a genial companion whose absence from our future assemblages will be deeply regretted.

In placing this Memorial and tribute to his memory upon the records of the Association we desire further to convey an expression of sincere sympathy to the surviving members of his family, a copy thereof to be sent to them by the Secretary.

H. J. WANDBERG, Chairman,
C. M. KLINK,
J. T. WILSON.

The memorial, on motion, was adopted.

THE SECRETARY: At four o'clock this morning the Secretary received this telegram from Chicago: "Give my highest regards to your officers and members. Sorry could not attend convention. E. W. Pratt." Mr. Pratt is Superintendent of Motive Power of the Chicago & Northwestern and an Honorary Member of this Association.

Information was received last night of the death of another member and it emphasizes what was said to you yesterday about making such losses known to the Secretary without delay. Mr. Frank Bannan died in December, 1918, and we should have known this at the convention a year ago. He was connected with the Big Four. The President appointed a committee on Memorial later and they submit the following:

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IN MEMORY OF THE LATE FRANK BANNAN.

With sincere sorrow the Master Boiler Makers' Association places upon its records the regretted loss by death of Frank Bannan of Urbana, Ill., whose interest in the Association was always of an active and efficient character.

While we bow in submission to the divine will calling him to a higher life we desire to bear testimony to the high qualities of mind and heart that marked the career of the deceased in this world and respectfully tender our sympathy to his immediate family and surviving relatives.

Resolved that the Secretary transmit a copy of this Memorial to them and that it be made a part of the Official Proceedings of this annual convention of the Association.

ANDREW S. GREENE,
R. P. CRIMMINS,
K. K. GILL,
Committee.

THE PRESIDENT: We will now have the pleasure of listening to an address by Mr. A. R. Kipp, Mechanical Superintendent of the Soo Line. (Applause.)

ADDRESS OF MR. A. R. KIPP.

Mr. President and Members of the Master Boiler Makers' Association:

I sympathize with you this morning. You were to have listened to our Mr. T. A. Foque, who has been unavoidably detained and I am here in his stead. I have no lengthy message for you but only a word of welcome and, I hope, encouragement.

The work of your Association in the past has been, indeed, very creditable. With the record that you have as a precedent and the opportunity of solving our present day problems as an inspiration, we are expecting big things of you. Railway officers fully realize that their organizations are undergoing a tremendous test. Precedents have been shattered. The old rules of the game are greatly changed and now we are facing the necessity of rapid, if not radical, changes in methods of doing our work to meet the new conditions.

You master boiler makers are a vital part of the organization which you represent. You are here to discuss the problems that are facing you as individuals with the idea of reaching some conclusions of best methods and practices. Such discussions and the contact afforded by this convention add to your enthusiasm as individuals, and you should be able to take home with you a greater desire to meet your problems and increase the value of your work.

The steam locomotive has grown in size and power far beyond the wildest dreams of a century ago. You need have no fear that the electric locomotive will take its place in any large degree except only in parts of the country where conditions are suited to the operation of an electric locomotive. We must, however, continue to increase its efficiency and hold down its cost of maintenance. We have plenty to think about if we are to progress.

Does that say autogenous welding is not reliable? I do not think so, gentlemen, and I dare speak with some authority. It has been my pleasure to have studied all four kinds of welding, especially during the past 15 years. I speak of the forge weld, the thermit weld, the electric weld and the oxy-acetylene weld. I have covered these subjects in my Mechanic Arts Lectures at Stevens Institute of Technology. In fact our students are compelled to take a practical course in all these types of welds. I therefore do not hesitate to say that I am an advocate of welding if it is done properly; and I believe good welds can be made by all four methods. I particularly believe in autogenous welding, as I know you do, and it therefore will not seem out of place to urge your association to take a stand in favor of autogenous welding. Why not insist on a rating for it, and then make it beat its own rating?

I wonder if you all have clearly in your mind the difference between a forge weld and an autogenous weld. There are o[illegible] ways of making a weld, in principle. One is by heating the metal up t[illegible] plastic state and forcing one mass into the other. You can do it with hammer blows, or by squeezing. The other method is by melting the two ends and running the two masses together. This is called autogenous welding. When it came into use no welding rod was used. The joint was made of the same material — which the word autogenous means. It means self-generated, or self-constituted.

I suppose we really ought to drop the word, because very few welds are now made without introducing a welding rod, and that brings another metal into the weld, which upsets the meaning of the word. So speaking precisely it is not really the right word to use any more. *Fusion* welding is the correct term to use.

Many people believe, and I think most of you gentlemen believe, that a fusion weld can be made just as strong as a plastic weld, but we still meet some who feel otherwise. They are suspicious of the fusion weld. That should not deter us. I remember some of the history of the forge weld. It is not so many years ago that it was looked upon with the greatest suspicion; and many of you know of the faked welds then made by hammer and sledge. Competition in welding in those days was unknown. It was either plastic weld or rivets. In many plants the plastic weld was so unpopular that the work was either riveted or machined out of the solid. But these conditions are changing. Welders can be depended on for better welds. Now the plastic weld has a real standing in engineering. If it has a rating, let's try to get a standard rating for the autogenous weld, so that the insurance people and the A.S.M.E will be satisfied. As it is now they simply say, "Look out! We will not indorse this!"

I would like now to speak of Mr. Pack's report and Mr. Hall's paper of yesterday. I am very sorry I could not be present to hear the paper and see the pictures. So far as Mr. Pack's report is con-

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cerned I have gone over all its data, which has upset so many people, and I think we are likely to do that gentleman an injustice if we are not careful. He is not prejudiced against welding. I found him very considerate and generous, not only in showing me the original data from which he drew his conclusions, but in giving me many other facts. He let me borrow some of those sections of exploded fireboxes, to have them photographed. I wish I had known this subject was coming up today so that I could have brought some of the pictures in lantern-slide form to show you.

If any of you gentlemen know who was responsible for those welds which Mr. Pack has, I would suggest that you try to get the men to give up their positions. They are the worst collection of welds I ever looked at. My 12 year old son could do better. And if you have welders who are doing that kind of work, you ought to get rid of them, or at least put them in a school where they can learn welding. Such welding does much to condemn the use of the modern methods which, if properly applied will produce results even better than the 52 per cent rating of the plastic weld. However, I don't think there is much of that kind of welding going on at the present time.

I know of one railroad system which is so optimistic in its belief in fusion welding that it is putting in a welding school for its welders, and in a little while it will require that no man be allowed to handle a torch or arc until he has gone through this school and completed its course.

It has been my privilege to travel about the country a great deal and I have seen the kind of welding being done. I have seen some remarkably fine work. For example, during the last few weeks the welding of some of the most difficult alloyed steels has been accomplished. They were supposed to be unweldable, but the oxy-acetylene torch did the work successfully. Here the fusion weld made possible what never could be done by plastic welding.

However, firebox welding is probably what concerns you most this morning. May I state quickly to you that I believe if you will put that kind of work in the hands of men who really know how to weld, they will produce just as good a job as any riveted joint would be. That of course is putting it very plainly to you, but it is my candid judgment after investigating the subject carefully.

I wonder if you all know just what a poor weld is? Will you imagine with me, please, that all of the engineering metals we use like steel, iron, cast iron, copper, brass and so on, have flat-sided grains. They have at least four sides. Some have as many as eight sides. They are not like a lot of shot rolling together, but they have flat faces made to hold firmly together by the natural law of cohesion. We have one metal in which the law of cohesion is so weak that I could destroy it with my finger by bearing down on it. That is mercury—the liquid metal. In chrome steel it takes a pressure of over 200,000 pounds to the square inch to break that same law of cohesion. But I can take an oxy-acetylene torch and reduce the cohesion until it is almost gone. There I must stop. If I go on it will not only destroy the law of cohesion, but will allow air to get in between the grains.

The air that we breathe contains both oxygen and nitrogen gases and both of these may be bad for a weld. When air gets in between its grains it forms a separation film that practically destroys the cohesion. Then we say the weld is oxidized. If in making a weld it is heated a little too far you will have that condition. Therefore, if you want a good weld heat it to the proper temperature, and keep out the oxide film. When a weld is heated to the molten state and allowed to cool it really is a casting. Then if you will let the weld get cold, heat it up to a bright red color and let cool down again, you will make the power of cohesion a little stronger—that is, the grains will be closer together. This same result may be accomplished by the hammering of a welding of steel while it is hot—that is, refine the grain so that it will go back to its original size and strength—and be sure to anneal the weld. The annealing of a steel weld is so important that it is probable rules will be made by the welding committees requiring the practice.

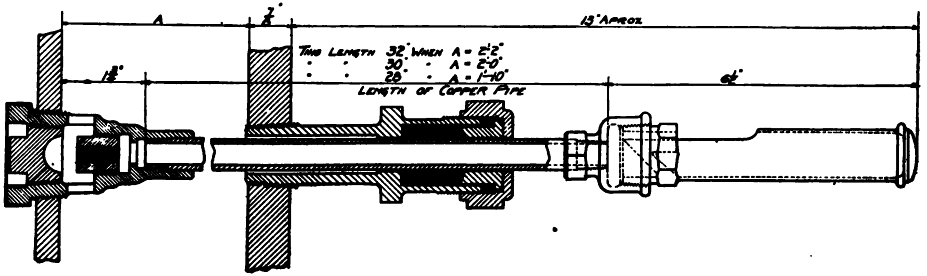
Some people contend that a fusion welded joint is weak because it is in the cast condition when it is completed and they prefer the plastic weld. I have examined many plastic welds and have found them very frequently with coarse grains and containing oxides. Taking welds as we find them the forge weld is more liable to be poorly made than the fusion weld.

If you have any questions which you think I might be able to answer in regard to the characteristics of these welds, and maybe some of the details of my study of Mr. Pack's report, I will be pleased to reply. Let me say at once, however, that one of the criticisms in that report is, that an autogenous welded firebox, when it ruptures will let loose so suddenly and violently that it usually does a great deal of damage. I wonder if you were a locomotive fireman about to be killed by such an accident, whether you would prefer the joint getting loose gradually and scalding you slowly, or whether you would rather have it all over quickly? (Applause.)

MR. GEORGE AUSTIN: I move a vote of thanks to the Professor for his address. It is one of the most interesting we ever listened to.

The motion was put and carried.

PROF. KINSEY: There is one important matter I nearly forgot. The American Society of Mechanical Engineers in considering this whole problem of welding will want some assurance that good welds may be expected as the regular thing. Your organization, therefore, may help much in this connection by thinking over a plan whereby welds can be compelled to do accurate work. This leads to the question: Shall we



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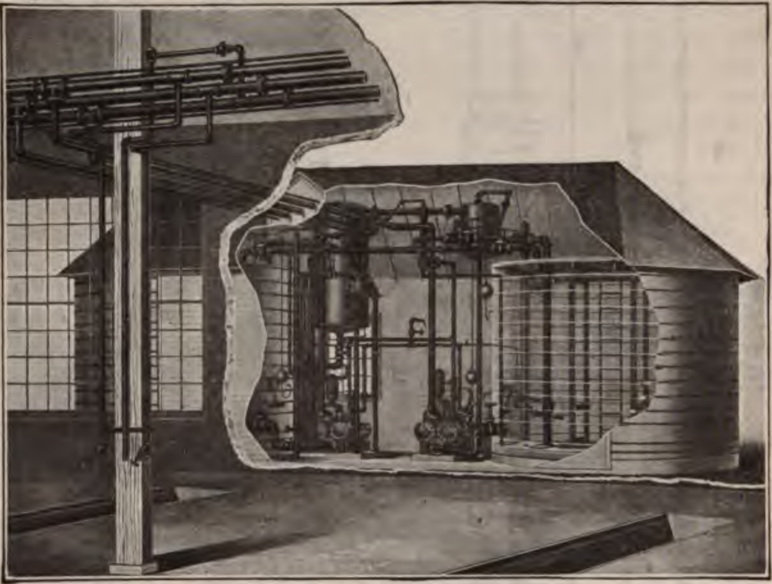

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license welders and make them pass an examination and show they are capable of doing good work? Or, shall we license the man who employs them? Something of that kind may be coming. You ought to think about it.

Mr. Whalen: Will Professor Kinsey please tell us which is the more efficient in a firebox, and will give us the best service: the electric or the acetylene—that is, taking it for granted that both were done properly?

Prof. Kinsey: As a professor of an engineering college it would hardly be proper for me to take sides by saying whether the electric arc or the gas flame is the best to use in locomotive welding. I will say, however, that a large amount of money is invested by the companies manufacturing the devices for these two processes. They have their engineers who will be glad to come into your plant and show you the best that can be done by their processes. If I were in your place I would ask the electric people to send their expert welder to show you the best job they think can be done in the welding of fireboxes; then ask the gas welding people to do the same, and then draw your own conclusions. Or, if you don't want to stop there, have the welds sent to some independent testing laboratory where they will give you an unbiased report. Of course you would have to submit a good many welds to get reliable results. I think if I was running a locomotive shop I would soon find out for myself which method of welding would give me the best service. I would be glad to talk to any of you gentlemen privately on the subject. As an engineer I am usually paid for such information but today you have my services without charge.

The President: The subject is now before the convention for discussion.

Mr. Carl A. Harper: May I ask Prof. Kinsey the best method of making inspection of welds and how to go about it.

Prof. Kinsey: A committee of the American Welding Society is now busy trying to determine a practical way of testing welds. It is a most difficult thing to do. First of all let me say it is practically impossible to determine exactly the condition of the interior of a weld without destroying it. Many things have been tried, like the vibration test and the tension test which after all is the essential test. The test for ductility is of the greatest importance, especially in the case of a vessel having a breathing action, as in pressure tanks. The scleroscope will test a weld for hardness and whether it will stand machining. Other ways which would be practical in shop work are being considered, but, so far, it is impossible to give any one particular method as the right way to test welds.

It would be of much value if some of you gentlemen who have been welding fireboxes for many years would pull apart some of your old welds. In fact if you have any of those welds, whether made by electricity or gas, many of us would be greatly interested in knowing just what condition they are in after years of service without failure.

Many of you are also interested in the repair of boiler tubes. Let me say to you, therefore, that the safe ending of boiler tubes has not been entirely condemned by the American Society of Mechanical Engineers, as many suppose. We asked the Boiler Code Committee to search their records to see just what action they had taken on this subject and we learned they were on record as being opposed to the safe ending of boiler tubes for water tube boilers, but they are not on record against *fire-tube* welding. You may see now just where we stand on the safe-ending of boiler tubes. There is no action against you so far as the Boiler Code Committee of the American Society of Mechanical Engineers is concerned, and we have good reason to believe that the committee will formulate no new rules on the subject before December, 1920, at least.

MR. LEWIS NICHOLAS, JR.: I believe the Professor spoke of the Society of Mechanical Engineers getting out a code that would require the annealing of welds in all sheets. They might as well tell us that we cannot weld a firebox; because the idea of autogenous welding as I understand it is to eliminate as much heating as possible; and if we anneal it we will cause expansion that we want to get away from. I would like him to explain how we can do autogenous welding and eliminate that expansion.

PROF. KINSEY: There will be cases where you cannot anneal. I did not say the Boiler Code Committee had decided you cannot make a weld without annealing it. I did say they were thinking seriously about requiring the annealing of steel welds. And there is a good scientific reason for it. I do not believe the action will be taken, however, until it is certain that it is a wise thing to do. So far as annealing a weld is concerned I do not think I would have very much trouble to know how to anneal a weld on a firebox sufficiently to overcome excessive strains.

MR. CHARLES L. HEMPEL: Autogenous welding has been criticised both at this convention and at the last convention, and no doubt it was just. I don't believe that its object was to condemn the autogenous process but more for the moral effect that it would have, and I am satisfied that it has served its purpose. The question has since been looked into very thoroughly. It has spurred us on to greater efficiency. I know it has me. And I know that we must overcome that criticism.

The Professor has mentioned a few things of which I show two samples—the perfect and the imperfect weld. One is from the safe-

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ending of a flue and is oxidized, the other is a perfect weld; isn't it, Professor?

PROFESSOR KINSEY: It looks like a very good weld. I would like to hit it with a sledge hammer to see whether it is oxidized inside.

MR. HEMPEL: The question of welding the safe-ending of flues has been agitated considerably by a number of large railroads. A few years ago it was pretty hard to make a weld that could be considered of any value. Unquestionably we can make a weld better than 100 per cent. The butt welds will break at from 23,000 to 29,000. All will pull in that range. Any of them could be considered absolutely safe for service. Inasmuch as the butt welding of flues was considerably criticised we naturally got busy to overcome that criticism. It was due to the failure of the flue. When it failed it would break off square. That would permit water and steam to go off in such volume that in nearly all cases the engineer or fireman was injured.

The lap weld was then taken up. In that case the accident would not be as great. Only a small amount of steam would escape if the weld failed. But I have yet to see the first failure of a lap-welded flue.

We have, with the butt and lap together, 600,000 electric welded flues. I don't mean to say electric welded on the bead: but electric safe-ended flues. In that number we have had two service failures, as against about six to the thousand of the old hand method. Every flue that we have pulled has given us more than 100 per cent.

Here is a piece of iron and steel, which, it is contended by a great many boiler makers is very hard to weld. It is not difficult. You can fuse iron and steel together just the same as you can iron and iron or steel and steel. The iron flue usually breaks at about 32,000; steel 34,000 to 36,000. The tube I show you was a little heavy I suppose, and failed at 32,440, and the other at 32,420. The inspector saw this bunch of flues pulled—in fact he picked them up himself at the plant.

I do believe that if we will get down to business we will not have this criticism. And I must frankly say that if the work continues as it has, and the government can show such defects as were shown on the screen here yesterday, that we will have quite a job doing acetylene or electric welding.

I have some data which I prepared. I didn't know just what the trend of the paper would be and I just drew my own conclusion as to about what I thought would come before the convention. I didn't prepare anything upon the acetylene feature, because the Oxweld people have had their demonstrators out and shown you how to do it, and I am satisfied they have shown you more than I could tell you. What I am going to talk about principally is the electric weld, with an analysis of both the acetylene and electric; and I have reduced this to writing, Mr. President.

Mr. Hempel then read the following and at its finish was loudly applauded:

ELECTRIC WELDING.

Paper By Mr. Charles L. Hempel.

The art of making good electric welds is comparatively easy, provided a few elementary rules are observed.

Electric welding is done from the negative pole. The positive pole is grounded on the work to be done, or to the table on which work is done.

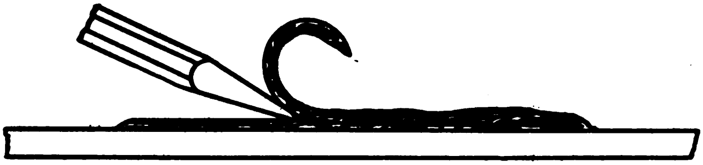
Before the welder begins his operation he must be sure that the electrode is connected to the negative side of the circuit, and that the positive wire is grounded preferably one-half to the old plate, and one-half to the new plate. Grounding on either will suffice.

See that work is properly prepared, free from dirt, grease or rust, and that sheets are properly cleaned with roughing tool.

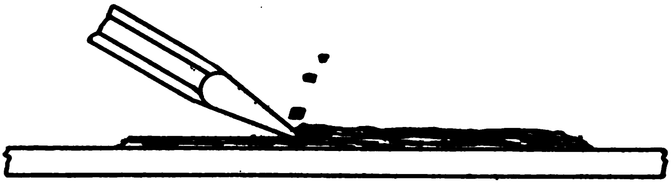
When changing electrodes or stopping welding to change position, the oxide which has formed on the surface of the weld must be brushed off with a steel wire brush before resuming welding.

To maintain a steady constant flow of metal be careful not to move the electrode too fast. Hold a close arc approximately one-eighth of an inch and move the electrode in accordance with the flow of metal.

In welding there is a critical temperature at which metal can be worked to give the greatest strength and ductility. If the heat rises above this critical temperature it will result in slag pockets. If the heat decreases from the critical temperature, the metal will be deposited in globules. Both extremes produce imperfections in the weld.



WHEN CHIPS ARE TOUGH, AND CURL AS SHOWN, THE WELD IS GOOD.



WHEN WELDED METAL, CHIPS LIKE CAST IRON, AND IS BRITTLE, THE WELD IS POOR.

The critical heat at which the metal should be fused is based upon the characteristics of the particular metal to be welded. This

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"Boyer," the world's standard riveting hammer and Little Giant pneumatic and electric drills, grinders, spike drivers and pneumatic hoists are other illustrious members of that "Chicago Pneumatic" family. Ability to "stand up" under severe usage is one of their most valuable characteristics.

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heat can be determined by welding two or three strips on a piece of boiler plate and chipping with a chisel.

The melting or fusing points range from 1650 up to about 2900 degrees Fahrenheit, from which it is very clear that the heat values necessary when joining metals together by the electric arc process will vary or must be varied to suit many conditions. Otherwise in one case the weld would be defective from lack of sufficient heat, while in another the heat would be so high as to damage the metal from burning.

The content of the metals most commonly welded by the electric arc process, such as iron and steel castings, open hearth or Bessemer steels, boiler plate, tubes, and some of the higher grade alloys vary very much in composition.

There is also a wide variation in the chemical composition of different metals. It is understood that welders are, as a rule, neither chemists, metallurgists nor electric engineers, and therefore know very little, if anything, about the relative content of the various metals, or the actual heat temperatures necessary in their fusion. If welders are not assisted in these matters they may proceed on wrong lines, when, if proper advice or instructions were given, which they would gladly follow, and it is desired to have accessible data which the welder can call to the attention of his superior in case he finds the metals do not flow properly or that the finished welds are not satisfactory.

Professor Kinsey made a few remarks relative to engineering knowledge—the technical side of welding. I am going to give him one, because I believe we have a practical side.

Sometimes those with technical engineering knowledge either on the physical or chemical composition of metals or their behavior under various heat conditions, may not promptly discover the real trouble in defective welds, when if data were at hand, it would serve as a valuable aid to them in finding the trouble and providing a remedy.

In case difficulty is experienced in welding certain kinds of metal, it is well for the operator to call attention to those in charge of the work so that a study may be made of the metals to be welded in connection with the proper electrodes to be used and the correct heat value which should be employed, to the end that the metals may properly flow in, fuse together, and thus produce a perfect joint or union.

MELTING POINT OF METALS.

Brass	1650
Copper	1980
Cast Iron	2200 to 2280
Steel	2600 to 2800
Wrought Iron	2500 to 2900

AMPERES TO BE USED.

For firebox and boiler plate seams where ductility and tensile strength are required, use one-eighth inch wire with 90 to 110 amperes, 65 to 68 volts at Master Panel and 18 to 22 volts at arc.

For flues in firebox with water in boiler, use one-eighth inch wire with 110 to 120 amperes and 22 to 26 volts at arc.

When using three-sixteenth inch wire add 10 amperes.

Always keep amperage and voltage, especially voltage, as low as possible.

Never raise the voltage at Master Panel for boiler work.

A volt is the pressure which forces the electric current through the resistance of a circuit and is the unit of electro motive force.

An ampere is the intensity of this electric current that flows through the circuit and is the unit of current.

The watt is the work done in a circuit, with a current of one ampere flowing at a pressure of one volt, and is the unit of electrical energy.

Voltage in electricity is pressure or power.

Amperage is volume or quantity.

AUTOGENOUS WELDING.

In analyzing this subject, it would appear logical to take up first the relative strength and behavior of the usual single riveted firebox seam as compared with a modern welded seam. If experience and investigation can show that riveted seams are stronger than welded seams, and continue stronger under service conditions, it is our duty to circumscribe, if not abandon the use of the welded seam. If, on the other hand, it can be demonstrated that the welded seam is as strong as the riveted seam, and is not subject to the same physical deterioration from service conditions, in that case we should give very careful consideration to the experience of a large number of railroads which have successfully developed the welding of firebox seams.

The maximum efficiency of a new single riveted seam is 59.3 per cent. From the moment this seam goes into service the efficiency falls off due to physical deterioration of the seam. Seams in fireboxes after having been in service for some time, fire crack between the rivet holes and the margin of the sheet; also are subject to burning and erosion of the margin of the sheet, so that cases may be observed any day where the efficiency of the seam has dropped as low as 20 per cent, or even less, in actual practice. Failure of such seams in stayed surfaces, under normal conditions, is rare, as the tensile duty is not high, but in case of low water such seams offer little resistance against failure, and could not be classed with an average welded seam for strength, while the autogenous welded seams run from 69 per cent to 87 per cent of the unit strength of the plate or from 38,000 pounds to 47,000 pounds per square inch, respectively.

Autogenous welding a few years ago was an experimental process surrounded by more or less mystery and ignorance, but it may also be said that the art of autogenous welding has been rapidly and scientifically developed in the last few years so that the day of successful welding has arrived and while the old argument may still be advanced that the success and strength of the welded seams is largely dependent upon the skill and personality of the operator—and it is conceded that the operator must be efficient to properly perform the work, at the same time the art has progressed so that it is not beyond the skill and ability of men assigned to this work to produce uniformly good welds.

Rather than condemn the welding process due to a few failures of early welds in fireboxes, a better method of attacking this problem would be to investigate these failures from a scientific standpoint and practical knowledge gained by experience.

I want to talk a little more, Mr. President, on a few statements I made at the last convention. I didn't have time to illustrate what I

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New York Central Test, No. 907, of December, 1909

Motive Power Men's Report guarantees the use of WOOD'S boilers and shows, by series of tests on 10 sheets, a saving of 7 per cent in coal during test of 4 years. (Analyze carefully.)

WOOD'S boilers were never out of service during the test, only at shopping times.

REGULAR boilers running against them were out for repairs from 2, 4 and 6 weeks at a time, between their shopping time.

Pacific Type of Boiler, with WOOD'S Fire box and Combustion Chamber, drawing by Baldwin's, shows 20 per cent of extra heating surface. Additional heating surface which guarantees 15 per cent saved in coal.

Wake up Mechanics and assist to save the country's coal which is being wasted.

22 per cent of the production of coal in 1917 was burned up in locomotives.

15,000,000 tons of coal can be saved annually by standardizing WOOD'S Fire Boxes and Tube Plates.

Railway Review, Page 7, Issue, Jan'y 4th, 1919, illustrates Motive Power Men's Standardized Locomotives, Types 2-10-2 and 2-8-2 with Boilers, Rigid Type, having 346 square feet of heating surface in Fire Boxes.

QUESTION: Would it be better if 20 per cent surface was added to the Fire Boxes, if they were made flexible, if 800 less stays were used, and if strength to the boiler was added 8 to 1?

See new patented Hydraulic Press for corrugating WOOD'S complete Fire Box, after being bent up and heated. Capacity 50 per day.

See New York Railroad Club Report, Vol. 24, 1913-1914, Pages, 3459 to 3478 and 3572 to 3578.

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meant, but said that if welding sticks are not as smooth as a silver dollar, and have a large end formed on them, you would not get good metal. I have some of these sticks and samples and a blue print, and the real reproduction of the stick. Hold it to the light and you can look right through the top of it. Welding with that amperage would not give a perfect weld. It is just as the Professor has said. No man can tell the strength of that welding; but you do and can know that you have got a good weld, by knowing what kind of metal you are putting in. Test out your metal first, and after you have the proper metal then put it in the boiler; that is all there is to the whole thing.

I don't think that we could guarantee the same kind of weld by half a dozen different men; but I do believe that you could take any good oxwelder or electric welder and get practically the same kind of weld right through. Take another man—you will get *his* kind of weld. Therefore we want to get the best man, drill him, and keep him on the job so that he will be interested. If a man is not interested we get nothing.

Mr. George Austin: Ladies and gentlemen, and Mr. President and gentlemen: The preceding speakers have practically covered by their remarks all that I could say in the way of practical information or suggestions, except perhaps to describe briefly the Santa Fe methods as to determining the efficiency of welders.

We realize, as Professor Kinsey has stated, it is impossible to determine the efficiency of the weld as to the cohesion; but it is not difficult at all where you have testing machines to pull the weld, and we do pull the welds. Each month each welder makes a sample for test which he sends in for test with his name stamped on it. If that test does not come above a certain per cent of efficiency that man is called in and we want to know why he sent in that poor weld. If he does not know, or is careless, he is not fit for that kind of work.

That is the Santa Fe method of testing welders, and we believe we have, in the best practical way known at this time, greatly assisted the welders in developing their skill. Men who have had their work tested and the imperfections of their welds shown them, are now able to make good welds that they know are good. I have no hesitation in saying that according to our experience reliable welders can and do make welds in fireboxes, or in other parts of boilers, which are as strong as any single riveted seam, and a great deal stronger.

In reference to the welded seams, I will ask Mr. Service, our welding supervisor, who keeps closer track of that than I do, to give you some figures as to the efficiency of our welding tests, not only of recent welds, but of welds which have had perhaps four or more years' service—some of them not quite so much—and taken out on account of sheet or firebox renewals. We cut out and pulled them to see what they stood.

Our experience now leads us to believe that the integrity of the autogenous weld can be compared very favorably with anvil welds.

We reinforce 20 per cent. In these tests, please understand we don't plane the 20 per cent reinforcement down to the size of the stock; it is the weld we are testing, and if we find it necessary we reinforce a weld 20 per cent to insure its efficiency; that is the kind of weld we are testing. (Applause.)

Mr. H. H. Service: It has been our practice on the Santa Fe, as Mr. Austin explained to you, to make thorough investigation of welds made by our welders. It is also our practice to have them make at least one test specimen a month and send it in to our headquarters, a disinterested party testing all specimens for elongation and tensile strength. He himself does not know the man or where made, but the numbers on the specimens are identified by letters which are sent to our Test Department or through our office. Sometimes, when work is not plentiful, welders will make two test specimens, and in the last six months one shop averaged nine plates per welder for 12 welders, this shop having 90 specimens of autogenous welded plates, with an average efficiency of 83 per cent. I am not giving preference to either the oxy-acetylene or electric welds at all. These are both kinds—autogenous welding.

This includes machinist and boiler maker welders; the machinist welders, however, do not pull as high as the boiler maker welders, as we ask the latter for 80 per cent efficiency; and when they do not come that high, they are cautioned that they will be set back.

Then again we take the fireboxes which have been cut out to be removed, and we cut out test specimens from the welded portions and test them. We have a record of who welded the patch, where it was welded and when. We also have a record of some that have been in service for four and one-half years; others two years and some one year. Out of 29 specimens tested the average efficiency was 71 per cent. Among the 29 specimens tested, nine were straightened. We discovered by straightening them that we deteriorated them to some extent; that is, where the patch was applied with a dish, when this patch was straightened, a small check one-eighth of an inch deep had penetrated into the metal, so that the welding lost that one-eighth of an inch. Therefore, the average should have been still higher.

As I go from point to point along our lines and get in touch with the welders I ask them, and at times they ask me, questions on metallurgy and how the machines are working. I also ask various questions about the acetylene and oxygen as well as electricity, to learn whether they are familiar with it. If they are not, I try to explain these things to the best of my ability. By so doing, we help the welders. If the welder has any questions he did not think of while I was there, he at times writes me. Therefore we try to get them interested so that they will learn the game.

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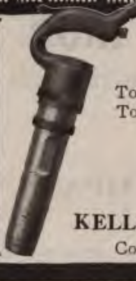

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I would venture to say that there are 30 to 40 specimens waiting to be tested now. Sometimes I see a patch taken out of a firebox and I mark portions to be removed to be tested. The welder does not know I am going to have them tested and often inquires as to what I am going to do with them. I usually tell him and on my next trip give him the results; then he becomes more interested.

We return the welded specimens to the welder so that he can examine them, and when I visit the points he gets me and we go over these things. If a fracture shows a real bright crystal, I try to explain to him why.

I have tried to agree with Mr. Hempel on this electrode proposition, but up to this time I have had hard luck. We have various kinds of electrodes. I have set the machine at one stage and have got all three different conditions on electrodes. From my observation this condition is due to the way you break the arc. For instance, the globule of metal may be just about to leave the electrode when you draw a long arc and the metal will become oxidized. In other words, the metal becoming suddenly chilled, it is oxidized, and when speaking of heat on electrodes the electric arc will develop more heat than any pyrometer that we have will register. Therefore, we have more heat than is absolutely necessary. So it is necessary to have each operator know what length of arc he must hold. It is the same with the acetylene torch. If the welder allows the torch to stay at one place too long, the metal becomes oxidized as explained by Professor Kinsey. (Applause.)

MR. GEORGE G. FISHER: I have a specimen of superheated tube welded by acetylene. It was put under a hydraulic press with a five and one-half inch ram and subjected to a 45 ton pressure. I would like Professor Kinsey to examine it and tell us whether he is able to find any fracture.

Owing to all that was said at last year's convention about different welding processes and in view of the opposition shown by the inspectors of the Interstate Commission I was not sceptical about flue welding because I had done it; but to determine the efficiency of a tube lap welded under a Hartz. machine and a butt weld made with the acetylene process, I had two specimens sent to experts at the Armour Institute last January.

Their report showed that one piece of lapweld broke at 10,370 pounds under the tension test and the butt weld at 12,000; the next broke outside the weld at 9,380 and the acetylene weld at 11,300; the third of the lapwelded broke at 10,100 and the acetylene at 11,100; the fourth piece of lapwelded broke at 10,200 and the acetylene at 11,610. Adding these resultants together and allowing for the percentage we found 13 per cent in favor of the acetylene. The lowest of the latter being 11,100 in the weld and of the lapweld 10,370 gave a percentage of 7 in favor of the acetylene.

Will Prof. Kinsey kindly tell us what he thinks of that weld? It was made, as well as those used in the tension test, by the same man.

Prof. Kinsey: The first test of a weld like this is to determine the hardness of the surface of the welded material. Any part of this I could file with the little nail file on my pocket knife. That certainly ought to be ductile, one of the finest qualifications in a good weld. It shows every sign of being a fine job. Of course my examination is superficial; but my eyes have been trained by looking at many welds; I should have no hesitation in saying that this is a good weld. There are also indications that show it has been allowed to cool down too fast—that the carbon has not been allowed to change in the weld, and it is very easy to do that, especially in making welds.

Mr. Fisher: We have five of the large Santa Fe type of engines, the total weight of each with tender being 592,000. The tubes are 23 feet long. They work day and night over a three and four per cent grade. They give no trouble at the welds. All of our other superheated engines are acetylene welded and never come in because the welds leak.

Mr. Hempel: The Professor said he would be very willing to give his own personal opinion of the value of a weld. I will ask him to give his opinion on the electric weld. He said the acetylene was good, and I KNOW it is good. I would like him to just give you his personal opinion of the electric weld.

Professor Kinsey: I can see that this is an electric weld. The two welds are therefore made by two different principles. One is a plastic weld, while the other is an autogenous weld. The electric weld is made by compression, not by the electric arc, which would be fusion welding. This weld is made by the gas torch, which is fusion welding. This may be the weaker because it is the plastic weld. It looks like an excellent weld. I hope you will therefore keep in mind the distinct difference between the principles of plastic and fusion welding.

Will you pardon me if I make a personal reference, and tell you that I have been keenly affected this morning by something you do not see yourselves. If an honest student of human nature could be here and see you gentlemen with bodies bent forward and hands to ear trying to hear, he would know why I raise my voice above normal. The price you have paid to advance your art, for the good of civilization, is of no mean value. Some of you have almost sacrificed your hearing because you loved your trade and were willing to give one of the five senses with which you were endowed. That has been your contribution to the public good—that we may have good safe boilers. Somebody had to do it, and you were willing. (Applause.) I will strain my voice, and will do more—I will write out what I have said for you fellows who cannot hear. I greatly appreciate your spirit of self sacrifice.

Now coming back to the subject of the meeting, I would like again to refer to the welding of fireboxes. Mr. Hempel spoke of the de-

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The automatic heat controlling panel of the **Plastic Arc** system is to welding what the pyrometer is to the heat treatment of metals. It eliminates guesswork. Without it metal can still be deposited as with any ordinary welding outfit, but without guarantee against imperfect welds resulting from cold or burnt metals.

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This outfit can be furnished as a motor driven unit, with a motor of practically any characteristics to suit the local source of power supply; also as a gasoline driven unit, or the 35 volt generator can be furnished without a motor to be driven by any means locally available. The normal generator speed is 1800 R. P. M.

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terioration of some firebox welds of as high as 20 per cent after a short time in service. I believe such rapid loss of strength to be due to the fatigue of metal. That may sound like a queer name. Can you imagine a piece of metal getting tired? It does not actually do so, of course, but it does go through a progressive action of losing its strength without destructon of the grains. The law of cohesion which holds the grains together, might give a tensile strength of 55,000 pounds to the square inch in the boiler plate at the start, but if a little oxide gets between the grains the strength may be reduced to something like 40,000 or even 30,000 pounds per square inch. Then if the weld is put in service and subjected to many vibrations the flat surfaces are encouraged to work apart. The oxide is the real trouble maker. It is a foreigner in a strange place, insisting on his rights. A regular bolshevist in between the grains! Do you wonder that there is fatigue of metal? (Laughter.) The only way to get rid of this nuisance is to throw him in the furnace and burn him out. But of course this is not practicable with fireboxes, and we should remember this when making welds. The oxide should never have been in the metal to induce fatigue. Poor welding did that. Vibration should strengthen the cohesion rather than decrease the strength of a weld, but that requires that the grains of the metal be kept pure. (Applause.)

THE PRESIDENT: We have heard one side of the story. Now we want the other. We claim that we don't know by its general appearance whether it is or is not welded: I know quite a number of other people here have had the same experience. These are given to us by scientific men, and by scientific work. What we want now is men who are caring for fireboxes and boilers that are actually in service, or pressure tanks that have actually been in service. Different cities and states have made laws allowing only 50 per cent on welded work. Some people will not insure it at all. We want to know that; and while we have always believed that autogenous welding was good for some things, when it comes to asking a man to ride on a high pressure vessel without his knowing what he has, I think we should go into it very carefully. Until it is possible for a human to be perfect in his work, a man ought to stand with a leg on both sides of the rail.

MR. GEORGE W. BENNETT: I have a report that I copied from the work reports at a small railroad terminal turning about 15 locomotives per day, and it shows to what extent welds are failing in service. It says:

"March 2: Two welds opened up in right side sheet 12 inches long.

"March 4: Two welds opened up about 11 inches long near center of side sheets.

"March 21: Weld opened up about nine inches long in throat sheet flange.

"March 22: Weld opened up 12 inches long in left side sheet.

"March 27: Weld opened up in right side sheet eight inches long, and two welds in left side sheet 12 inches long.

"March 28: Weld opened up in throat sheet flange nine inches long."

Going further back in the work report revealed the fact that some of these locomotives had been sent back to the shop several times to have weld failures repaired. On another railroad the work reports showed weld failures on 15 locomotives; and I could have gone further back and found many more; so that goes to show that many welds are failing in service.

Information obtained from men in a position to know shows that the second rewelding of a seam does not last as long in service as the first weld, and the third reweld of a seam does not last as long as the second rewelding, etc. This demonstrates that welded seams in fireboxes deteriorate materially with age owing to lack of ductility and the enormous but unknown temperature stresses caused by local heating and the unequal expansion and contraction which sets up intense strains. Poor workmanship hinders the progress of the welding art and in many cases causes condemnation of the welding process. Tensile strength may be pretty well maintained by a skilled operator but the ductility as evidenced by the elongation and the reduction in area of test specimens bears at best about the same relation to that of good boiler plate as does that of steel castings.

Mr. H. H. Service: We will have to agree with Mr. Bennett on some things. I have a staybolt diagram here which shows a crack on the right side sheet in the original plate extending five staybolts high, and as one of these test specimens was removed after the crack had been welded and no allowance was made for expansion or contraction, it showed 80 per cent efficiency, after it had been in service for a year. We hear a lot about welds breaking, but no one is saying a thing about the original sheets breaking. (Applause.)

Mr. G. W. Bennett: Answering the remarks of Mr. Service about the original sheets breaking—they don't break to the extent that these welds have given way.

Mr. Alfred F. Stiglmeier: After hearing all that Mr. Bennett has said about failures in electric welding, I know members will get up and say that they are getting 100 per cent in electric welding and have no failures of any kind on their railroad. I know that the Baltimore & Ohio Railroad is doing as much, if not more, electric welding on boiler work than any other railroad, and while we are getting mighty good results, we are not getting 100 per cent, but we are trying to do so.

I would like to bring up this question: "What is the cause of electric welded flues cracking at the bead end?" Is it due to poor material, improper application of flues, or flues being electrically welded? Some members will say that they have no cracked flues at all; others

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SEPTEMBER 11, 1920

and the Secretary has been directed to furnish its members with a complete list.

will say that this condition is due to poor water; but I do not agree with either of these propositions, as I know from personal experience that railroads having the best of water conditions are having electric welded flues cracked at bead end; and I know all railroads are spending considerable money trying to get at the cause of this trouble.

If the convention cannot come to an agreement on this subject, I would like to have a committee appointed to consider my question, and report their findings at next convention.

Mr. Lewis Nicholas, Jr.: Small flues crack as well as the superheated. We have had them do so six months after they were put in.

Professor Kinsey: I think it is quite important that you should put yourselves on record as a society. I am speaking now for the American Welding Society. The Mechanical Engineers take the same attitude. You should be unusually careful. The oxy-acetylene torch is a powerful tool. The high temperature of its flame with its consequent quick melting powers might make it almost dangerous if carelessly used. But dynamite at first was considered to be so dangerous that it could hardly be gotten into use. So you need not fear your welding torch; rather learn of its possibilities and use it freely.

Some have worried about the safety of fusion welds but whoever worried about the welds in the pipes in the streets of cities like Paris? How much do you worry when you sit down often in rooms where there are welded steam pipes? You have thought nothing of sitting alongside of 200 pounds of steam pressure in a locomotive, and all of the pipes there are welded. Have you heard of much trouble with the welded pipes there? So you should not be afraid of the welded firebox seam or other pressure welds. You have been living amidst welds and never realized it.

Mr. Whalen: I am of the same belief today that I was a year ago at the Chicago convention. When it comes to different methods of welding, especially electric and acetylene, either can be done proficiently provided a welder has hold of the arc or the torch. If he is a competent welder either can be done successfully. It depends entirely upon him.

I can agree with every man that has talked on this subject. Mr. Bennett has said something that is good. The average boiler maker foreman can go around from shop to shop, and ask, "What are you getting out of your welded fireboxes?"

"Oh, we are not having a bit of trouble. We are getting some good results!"

"Well, we are having some trouble with material."

We can successfully weld flues—safe-end them, either way. In the past 12 months I have overhauled 35 to 40 superheated engines, and every superheated flue has an acetylene safe-end. I have not had a failure or complaint about either engine since it went back into service.

The question has been asked, why do superheated flues crack that are electrically welded? In our hard water district I find two causes. First, you may or may not have the best of material in your safe-end; secondly, if you are in a hard water territory, have an electrically welded flue that shows a crack through the flue hole, and that flue has never been prossered or worked in the past three or four months (some say they work 12), you will see that there is a scale formation where the copper pin goes through the flue sheet. That forms a hard scale. The flue not being worked no water gets next to the joint, the fire becomes too strong and causes the metal to begin cracking. The scale is probably one-eighth of an inch thick, and in some cases, if it has run very long, it will be heavier. Consequently there is no water against the joint and the flue naturally will crack. The same is true of side cracks, commonly called pin cracks, under the arch, where the combustion takes place. You will find in hard water districts that there is a hard scale in the crotch that will gradually build up. The engine's heat will cause the head of the staybolts to loosen up; and that will start the formation of a pin crack. It works the same way with a superheated flue, only they don't work it. It would be better if a flue were prossered. The operation cracks the scale and allows the water to get next to the joint. While there is condemnation of the two methods of welding, if looked at in the right way it can usually be traced to an incompetent welder. (Applause.)

Mr. C. E. Elkins: With regard to the electric welding of flues, it seems to be the consensus of opinion here that whenever a weld has failed or welded flues have leaked, it is due to some incompetent welder. I would like to ask where the foreman is while all of these incompetent welders are working. Why are they not on the job seeing that the work is done as it should be? When work fails around my place of business I always feel as though I was the one responsible for it. Flues can be welded in the flue sheet so that they will hold. If they are properly expanded and beaded, with the copper flush with the sheet in the firebox side, then have the engine fired up so as to burn off all the oil and foreign matter, then sand blast the sheet and, with the flues perfectly clean there is no reason why a good job cannot be done. We run engines from 100,000 to 150,000 miles without having the superheated flues leak, and engines with two inch flues from 50,000 to 100,000 miles without any trouble, but the work must be properly prepared and perfectly done, and that is the foreman's part if we are to get the results that our superiors have a right to expect.

Mr. James P. Smith: A former speaker said he had electrically welded flues that never leaked. I had some experience on 12 new engines sent out from the locomotive works with electrically welded flues in a bad water district. They made three trips—and they *leaked!* (Laughter and applause.) They leaked badly! I am going to take the unpopular side of this question. Not because I am opposed to autogenous welding, but I am looking for information. We get engines out of our back shops that have welded seams, the fire door welded to the back head; and they leak; sometimes they don't make very many trips until they leak. We all know that the fire door with the flange welded to the back head is one of the easiest welds there is to make; and I ask if you ever saw one leak that was put on with studs? They leak where you weld them. I have had them crack half-way around. I don't know whether it is due to an incompetent welder: it may be; I am not an authority on welding. I never did any welding. I have seen quite considerable done. Possibly a weld is all right in a good water district. I want to know whether it is successful in bad water territory? We have water that runs about 67 incrustation grains to the gallon.

Mr. L. A. Borneman: Does the gentleman know whether or not the seams are lapwelded, and how they are prepared? He claims he has fire doors that leak. There is a way to weld the fire door and not have trouble, and a way to do so and have trouble.

Mr. Elkins: I have been welding fire doors for the past seven or eight years. I expect I have welded 150 doors in that time and have not had a crack in any of them. If his doors are cracking he is not doing his work as it should be done.

The President: The gentlemen must remember the rule to give everybody an opportunity to speak, and no man try to monopolize the whole convention.

Mr. D. A. Lucas: Mr. Bennett's remarks have brought some ideas to me. With reference to the welded seams opening up I would like to know whether a comparison was ever made between the firebox turned out with the welded parts, and the side sheets failing, and the firebox turned out with no welding and no patching that failed by cracking, when no defects were visible while it was going through the shop? Was any comparison made with a firebox patched in the old way that needed much attention while going from one shopping to another?

I have turned out side sheets in a welded condition, where possibly 10 or 12 inches would open up in the seam during the performance of the engine from one shopping to another. In other cases I have turned them out where it was impossible to detect any defect in the sheet while the engines were in the shop for repair, but cracks would develop when they were back on the road and not much was said about it; if it was a welding job a good deal was said; the firebox with the patch applied in the old way would leak. Welding has been a big help and is a success.

MR. BENNETT: In reply to Mr. Lucas' question I will say I am very familiar with conditions on the road covered by the work report I cited and that riveted seams in many cases went from shopping to shopping without leaking. In answer to Professor Kinsey's remarks about sleeping with high pressure pipes and not knowing it, I wish to say that if those high pressure pipes were causing loss of life and injuries, somebody would sit up and take notice.

MR. ALBERT W. NOVAK: The locomotive to which Mr. Smith of Aberdeen, S. D., has referred is the 2011. I happened to be at Aberdeen at the time this engine failed owing to a weld breaking at the door hole. The break was half-way around the bottom part of the door. Investigation showed that the door hole flange on the door sheet was small. Just the end of the flange was laid up to the backhead allowing a space between the backhead flange and the door sheet flange. This allowed incrusting solids to form and prevented the weld keeping cool. It was a lapweld three-sixteenths of an inch in thickness and not reinforced enough. It was the first that broke in that manner since welding was started on the Milwaukee road. We are doing a great deal of welding and are not having much trouble.

MR. P. J. CONRATH: Listening to the discussions relative to welding and the failures cited, it occurs to me that probably you have not given the nature of the material sufficiently close study. From a boiler maker's standpoint we all know that hardly any two metals will stand or weld properly with the same degree of heat. If there were some way of testing the material used to fuse, as well as studying the nature of the material to be welded, you might possibly overcome some of this trouble.

The lowest degree of heat for properly welding steel is about 2450 degrees Fahrenheit. Material that will weld at that degree reaches the danger point of burning at about 2800 to 2900 degrees. Other material will stand as high as 3200 to 3300 degrees. If it were possible with a pyrometer to get the necessary degree of heat at which the metal will fuse and weld best, I believe you would overcome some of your troubles.

MR. GEORGE AUSTIN: Some members have spoken about trouble with flues electrically welded to the back sheet. We have that trouble, and I suppose any road that has the ordinary water to be found along the railroads west of the Mississippi, and some places in the east, have more or less trouble.

We weld flues in one certain district where, previous to welding the flues to the back sheet, 9,000 miles between shoppings was not uncommon, and 15,000 miles was uncommonly high. By welding the flues in the back sheet that mileage has been easily doubled—in some cases as high as 40,000 miles between shoppings being attained.

We don't mean to tell this convention that we didn't have to do anything to those flues, or that they didn't leak at all while they were getting this mileage; because they did. In some cases we had to chip off and renew the weld; sometimes several times, but we did succeed in more than doubling the mileage between the flue settings and practically eliminated locomotive failures on account of leaky flues.

Now we are trying an expander for knocking away the dirt which causes this leakage. We take the standard expander and grind it out so that it has no bearings except in the prosser marks and the inner half of the flue in the flue sheet. This avoids crowding the bead over and breaking the weld. It is our opinion so far that we have increased the mileage between shoppings due to the use of this expander. I believe it is the best thing we know of to remove the scale causing this trouble.

Mr. T. J. Reddy: I have been very much interested in the discussion as to the electric welded flues, especially superheated flues. The electric process we have not installed, but I have been trying to get it, as we received some new Mikado engines that have electrically welded superheat flues. Our superintendent of motive power asked why I wanted to weld the flues. I told him I thought that to a certain extent it would prevent leakage of superheat flues. Unfortunately we have heavy engines and have been getting 100,000 to 120,000 miles service out of a set of flues. The new engines that we received with the flues electrically welded are going through the shop after making 30,000 to 40,000 miles, and I am compelled to remove all of the superheated flues on account of the beads cracking. We have been using the acetylene process about seven years, and had very good success. I am tickled to death if I can get 50 per cent of the welds we make to hold and not give us any trouble. I have followed it up very closely but it is not yet absolutely perfect, and I fear we are not going to have it so owing to the conditions under which we work. When I have developed a capable welder he takes a notion he wants some other job in the shop, and gets it. Then I have to take the next oldest man and put him on that job. So it just keeps me training new men continually. I have to devote a whole lot of my time to instructing those men; and I am not an oxwelder myself.

Mr. G. W. Bennett: That is the first man who has told the truth here today! (Laughter and applause.)

Mr. Reddy: Going to different shops, I get in touch with the foreman, and ask him, "What success are you having with your welding?" I get to the men in the roundhouses, and find they are having as much trouble as I am.

Mr. Thomas F. Powers: On the Northwestern we began welding flues about eight years ago; after two or three years we made up our minds that it was not a success. Now I know a number of gentlemen here will not agree with me. You can weld flues in good water districts and make them hold. But you can't do it in bad water territory. I think some of our trouble is that some of us are too enthusiastic.

I have heard our superintendent of motive power say that he had been told by certain railroads, "Why, we have laid off all our boiler makers, because we have welded our flues." Some time ago I was talking to a man about this proposition, and one of the fellows advocating it told me they were not having any trouble on their railroad at all. Later I heard from their foreman and he said his company was losing thousands of dollars because of welded flues. Where you have to weld flues and where you have to expand them, and trim them off again every little while, it is not a success.

Mr. T. P. Madden: I happen to be in a position to check flue welding on 7,000 miles of railroad. Previous to welding flues, in some of our bad districts, it was frequently impossible to get 90 days out of a new set of flues before bad leaking conditions began and necessitated working the flues at both ends of the run. Our failures at first were due to the inexperience of the operators. We now have men at some of our principal shops who will weld a set of flues, both small and large, which will run for 26 months or longer without trouble.

We do not have a lot of cracks in our flues because the men are instructed to use the air hammer to loosen the scale from the face of the flue sheet. We cannot prevent side sheets leaking in some districts without the use of the air hammer to remove this scale; we cannot keep our welded flues tight, and we cannot get any place *without* welded flues. We have in service approximately 900 engines with welded flues. We experience some trouble, but find that it is due to improper welding.

Mr. F. J. Jenkins: We probably have as many electric welded flues as any railroad having only 400 engines. There is no worse water anywhere in the world than we have on our line in West Texas. We have approximately doubled the mileage on all classes of power on our railroads by the electric welding of flues. We have gotten 31 months out of some passenger engines with flues electrically welded that we only got 14 months' service previous to welding. The success of electric welded flues depends altogether on the manner in which the flue is applied and prepared for welding, and the welder who does the work. We have in service now seven Pacific Type passenger engines, 26-inch cylinder, superheated, with electric welded superheater tubes and flues that have made to date 70,000 miles on some of the heaviest and fastest passenger trains on any road in Texas. These engines have not had a delay or a failure, on account of flues leaking, since they were put into service. These engines could not have been operated as they have been for the past 14 months, without the flues being electrically welded.

MR. E. J. SWEENEY: I agree with Mr. Powers that you cannot successfully weld flues into the sheet. We have 2,800 engines, and in 1915 the flues of all were electrically welded. Since that time we have discontinued the electric weld and had no trouble. In six months you would not have known those engines on account of mud conditions. They are all handled by the same supervising crews and the same boiler makers. We used compounds and the best tubes made and the best welding wire. I contend you can't run welded flues successfully in a bad water district. Now what is the use of electric welding them if you can get better service out of them without doing so? (Laughter and applause.)

THE PRESIDENT: Any further remarks?

MR. H. B. NELSON: We have had an electric welding machine in our shop about seven years. We began welding flues when it was installed. We had some trouble at first. We were not preparing the sheet properly, and taking care of the copper. Since then we have welded every flue on our railroad. I absolutely know that on our passenger engines we have reduced engine failures 75 per cent by having the flues electrically welded. I have seen engines come back to the shop after 18 or 20 months' service that looked just as good as the day they left. We overhauled some engines in our shop during the war for the T. & O. Co. and I never saw any better welding of flues or patches. I believe Mr. Keefe can tell you whether our welded flues held or not when they went to another railroad.

MR. R. W. CLARK: I have been listening to the arguments all the morning. The further we go the less we learn. Where I am located we don't have these troubles. We have electrically welded flues which have been in service four years and absolutely give no trouble.

MR. JOHN B. FELD: We have but few riveted running seams in our engines. Those we had were cut out and welded up and good service has since been received. We have had failures in a few engines but in comparison with trouble we had with riveted seams, especially on our larger engines, they have not been considered of any consequence. It has never been necessary to go back and reweld. Originally we lap-welded door holes, but as mud and scale caused cracking of the weld by getting under it we changed to butt welding and had no further trouble. When the weld was applied straight, on the inside of door collars trouble followed which was overcome by putting a corrugation around at the back about one and one-half inches, not more than five per cent of the welds having failed. We also corrugate a new sheet in the running seams and all patches in the firebox. Old holes are cut out about one and one-half to two inches back of the weld on flue sheet and weld in a new sheet. No trouble whatever has followed. Flue sheets welded in this manner three years ago show no signs of cracking. On some of our engines we were unable to keep riveted running seams until we welded them up with the oxy-acetylene process. Since then we have had no trouble whatever.

Mr. S. A. McMonagle: We have electrically welded flues in 66 switch engines which are used in one of the hardest worked terminals in the country. While not advocating arc welding for all flue work it is a fact that we have absolutely no trouble with flues welded with that process.

Our chief trouble is from transfers of engines to an outside division where they are overhauled in a shop having no electric welder. Two or three days after being returned to service they leak so badly that it is almost impossible to keep them in operation until welded with the arc and then there is no more trouble.

The switch engines to which I have referred are in continuous service for 24 hours—in many cases up to the government four year limit when, upon inspection, the firebox flues look so good it seems a shame to remove them. They show no leaks.

We do not do as much electric welding in fireboxes as some of the larger shops on the road, as we do not handle such heavy work, but we successfully weld side sheets, flue sheet seams up to the O. G. door collars, crown sheet patches and side seams. Every door collar or door sheet put in at this point is lap-welded at the door hole.

We are particularly fortunate at our shop owing to constant opportunity to watch results. After an engine is overhauled it works in the terminal so that at all times we can keep a check on its performance. The forces of the transportation department being alert for trouble that may develop we have to be very watchful but we absolutely have no such complaints to make as have been heard on the floor of this convention with regard to welding flues and door holes, nor can I recall complaints from any other point on the Missouri Pacific; on the contrary I have heard only the highest commendation.

Mr. Frank Walla: In view of statements made here about 100 per cent on flues electrically welded I believe it would be in order to have a committee appointed to visit shops where they say this has been done, find out how they do it, and make a report so that all railroads may have the information and be correspondingly benefited.

Mr. Lewis Eberle: During the past 12 months we had about 12 or 15 sets of side sheets welded in that cracked between the staybolts but not in the weld. Some of our engines have been supplied with a third set of flues during the past four years.

Mr. J. M. McCloskey: I want to know something about welding a crack between staybolts from hole to hole. They claim cracks are in the weld or side of weld owing to the lack of a free end. What Professor Kinsey said on the nature of steel made me think I had done something unconsciously. I prepared the crack and welded it, and while still hot from the welding rod, I heated it up red, and then roughed it up with air hammer and roughing tool until cool. The inspector did not approve of this method. So we applied the hydrostatic pressure and it was found to be all right.

Mr. Frederick J. Howe: We have been welding fireboxes for several years. In my opinion a good weld is dependent upon the skill of the man handling the torch. Every failure we have had has been due to improper fusing of the metal.

Mr. Andrew Anderson: In our good water district we have no trouble with electric welded flues, but in bad water districts the welding breaks away from the bead and sheet. In some cases cracking occurs toward the prosser mark, which, no doubt, is due to the accumulation of scale around the flue causing overheating of the material.

With our acetylene welding we have been very successful in welding in one-half and two-thirds side sheets, and two-thirds door sheets; but in welding in small patches we do not get the same results. In a number of cases I find that vertical seam cracks develop shortly after going into service. Part of this trouble may no doubt be overcome by putting in round patches.

The President: Gentlemen, the subject is closed.

Mr. James W. Kelly: At every convention we talk about these different features and every man has a different opinion, which he believes is right. I wish to make a motion. Mr. Walla suggested a moment ago that you appoint a committee to investigate the welding of flues in good and bad water districts. Men come here and say they have had success. They would not say that unless they believed it. Now don't let us fool ourselves. Make all the rules you wish, but it takes some strong backing to have rules carried out. I think I have fought it as hard as anyone. You will find men in roundhouses who say: "Certainly. we did that work all right!" Put on your overalls and see if they did it. Now let us have a committee that will put on their overalls, visit these shops where they claim they are having success, and report back here a year from now.

The President: That subject will come up tomorrow under new business. As our time has expired on this subject, we will close it.

Mr. Kelly: Well, I withdraw my motion then, and will make it tomorrow.

TOPICS FOR 1921 CONVENTION.

The President: The next subject is Topics for the 1921 Convention; committee, J. F. Raps, chairman; D. G. Foley, and George Austin.

Mr. Walla: I was declared out of order in proposing a motion. If we have any new business, 1921 business is certainly new. Were the other two topics, washout plug and——

A Member: Sit down!

The Secretary: It was hoped by the Executive Board that the point raised by Mr. Walla would not come up and would be quietly passed. The Executive Board has ruled out two subjects—the reports on ash pan and washout plug, because they were not properly before the convention. They were not on the list of subjects adopted last year for this convention.

The report of the committee on topics for 1921 was read and on motion of Vice President Lewis adopted.

REPORT OF COMMITTEE ON

"Topics for 1921 Convention"

Topic No. 1. Describe present and best method of welding safe ends on locomotive tubes:

- Iron end to iron body.
- Steel end to iron body.
- Steel end to steel body.
- Shape and length of scarf, and flux, if used.
- Results obtained by applying safe ends without scarfing.
- Degree of heat necessary to obtain best results in welding and advisability of having a pyrometer on welding furnace.
- Scrapping weight of different sizes of flues for various pressures.

Topic No. 2. Are the advantages and merits of the hot water boiler washing system of greater benefit than the disadvantages? Describe system used and what benefit is derived therefrom.

Topic No. 3. Which is the better crown stay for the different classes of locomotives; the stay screwed into the crown sheet with the taper and riveted over, or the button head crown stay?

Topic No. 4. How can the deterioration of firebox sheets behind grate bars and supports be eliminated?

Topic No. 5. What is the cause of the boiler shell cracking through girth and longitudinal seam rivet holes? Is there any way in which this can be overcome or the time of rupture be prolonged?

Topic No. 6. What is the best type of side sheets to be applied to narrow and wide firebox locomotives? Depressed, corrugated, vertical or longitudinal, or straight?

Topic No. 7. What is the most economical method of repairing cracked mud rings or corners without removing the mud ring?

Topic No. 8. Oxy-acetylene welding.

Topic No. 9. Electric Welding.

Topic No. 10. Law.

J. F. Rafs, Chairman
D. G. Foley
Geo. Austin

The President: The next topic is the report of the Committee on Law.

The Secretary: The committee is Mr. A. R. Hodges, Mr. George W. Bennett and Mr. J. A. Doarnberger.

Without disposing of this business the convention adjourned until May 28th at 9.00 a. m.

FOURTH DAY

The convention reconvened at 9.00 a. m.

THE PRESIDENT: Gentlemen, come to order. We will hear the announcements of the Secretary.

THE SECRETARY: We have received 40 applications for membership which have been approved by the Executive Board. At the last convention action required under the Constitution and By-laws was overlooked. The Secretary suggests at this time a motion to ratify the action of the Executive Board with regard to applications of both last year and this year.

The Executive Board, the Secretary is pleased to say, has been very conscientious in the handling of these applications. It might interest you to know, as showing how carefully the work is carried on, that in several instances applications were presented by gentlemen who were already on the membership roll, but were delinquents. Of course this cannot be known until the applications are entered up. With this index card system under which your affairs are now conducted, we checked up the applications received at Chicago with the cards, then rechecked with the old book records and discovered these delinquents had been in arrears for a number of years. In only one instance were we unable to induce the member to make good. In all the others they paid the amount required in addition to the $5.00 received with their applications.

On motion of Mr. Laughridge the action of the Executive Board upon all applications for 1919 and 1920 was ratified.

THE SECRETARY: The management of this hotel through Mr. C. C. Meloney, manager, extends its greetings to all members of this convention, Mr. Meloney saying in this connection as was said by the late Theodore Roosevelt: "You are a lot of bully good fellows, we like you and hope you will come again." (Applause.)

GRATES FOR BITUMINOUS COAL, ETC.

THE PRESIDENT: The topic for this morning and the last on the convention program is No. 10: "What is the Best Style of Grate for Bituminous Coal, Location of Dump Grate, Percentage of Opening in Grates and of Draft Opening in Ash Pans Compared with Area of Grates?"

THE SECRETARY: The committee appointed on this subject did not make a report. Mr. Whalen, its chairman, found at too late a date for other arrangements to be made, that he would not be able to prepare a report. A member of his committee, Mr. Strinsky, this morning handed me his individual report. Under the rules of the Association a motion would be proper at this time for the convention to decide whether it shall be received out of order.

On motion of Vice President Young the report was read, and is as follows:

This is a hard question to answer owing to the various grades of coal used. Out on the west end of the C., M. & St. P. Railway, they use the box grate, which is giving satisfactory results. The dump grate should be located in front end of firebox on road engines. In switch engines, the location should be governed by the size of the firebox. In a long firebox it should be on each end of the firebox. This will expedite cleaning.

The percentage of opening in grates depends on the grade of coal used. On the road with which I am connected it is about 28 per cent. The draft opening in ash pan should equal that in the grates.

MR. A. N. LUCAS: The Great Northern was the first in this section to use what is commonly called a box grate, and the Milwaukee acquired the habit of calling it the Great Northern grate.

THE PRESIDENT: I suggest that that be put in the record—"The grate used by the Great Northern."

MR. LUCAS: No: just call it a box grate. It is a good all round serviceable grate, and will give results at about nine to nine and one-half inches in width. The percentage of grate opening should be about 30 or 40 per cent. The time is coming when a dump grate will be eliminated from both ends of the firebox. With a proper grate, made to open sufficiently to get rid of cinders and clinkers, a dump grate is not necessary. Many roads are eliminating the dump grate, which will be a big saving at the clinker pit, in the shop, and all round. The ash pan opening should be 13 to 15 per cent of the grate area; and you might get more. Many times locomotive ash pans are so constructed that there is very little opening, and it has always been my practice to get more ash opening if possible.

MR. WHALEN: More good was accomplished by the discussion, yesterday, than at any other time during the week. We heard from all sections of the United States. Everybody had something to say. And I believe every topic we have before this convention can be made of equal interest if everyone will give his views. That is the only way to bring out the good and the bad on any subject.

I am sorry I was appointed chairman of the committee on this subject and could not serve; and I am ready to confess that I was asleep at the switch for some time after being notified; but being the only foreman on our road, and not having the opportunity to get around and see what other roads were using, the different qualities of coal, etc., I didn't feel that I could give the paper proper time and attention. However, I am ready to say something about the grate proposition and the ash pan opening, whether others agree with me or not.

I attended the fuel conservation convention last year in Chicago. They talked on fuel economy, the grate subject, and the ash pan opening. Transportation officials of all kinds were there. As a rule a lot of them (I am not reflecting on any of them), know more about an engine than the man erecting it. But they got out good dope.

We have been and are using the finger grate, but it wastes fuel. We are catering to the box grate about nine inches wide. It is far superior to the finger grate and the best grate of which I have any knowledge.

As to the position of the dump grate, in ordinary good coal—mine run coal that doesn't clinker too badly, a dump grate is not needed. We have them in our engines, but seldom use them, because they open so wide you can punch out everything without opening the grate. If a dump grate is used in your firebox, keep it from under the flues. I doubt that a fire is ever actually clean, and if you drop your dump grate the fireman will open your blower; then there is a big hole of cold air under the grate. Fires have to be cleaned out on the road. When some little sidetrack is reached the fire is dumped and the result is leaky flues. On 39 new locomotives we bought four years ago, we changed one of the dump grates from the flue sheet to the door sheet and had fewer engine failures and leaky flues.

As to the ash pan opening, I found on examination that we had some as low as eight per cent, as compared to grate area. They were changed. Mr. McManamy had the best results at the fuel convention that obtained with not less than 15 per cent opening area compared to your grate area. We adopted that for all our engines, as near as we could without making a different design of pan. We are getting better results and burning less coal. How much *over* 15 per cent I will not say. I believe in plenty of free pan area under grates, otherwise the fire will not burn. It takes oxygen mixed with combustion to make heat, and if oxygen is not kept out of grates you cannot get heat. I also believe in a central air opening to an ash pan. I haveridden with the enginemen to try out the McCulloch type of wide firebox with which air is taken from the grates. Coal is fed to the side of the firebox nearly all the time, so that there is less need of it in the middle. It collects the air. When it strikes the side there is where holes are found. I tried it out on some engines having the wide fire box and got a better fire. It has been said that as a rule when a man designed a locomotive he forgot the ash pan. In some cases it has somewhat appeared so. The ash pan is a great asset to the service of an engine, especially in the consumption of coal; and a great question before the railroads today is fuel economy.

(Mr. Charles P. Patrick in the chair.)

Mr. C. E. Elkins: On the Missouri Pacific we are using a blow-out ash pan in place of the old style hopper pan, and find it much superior both as to cheapness in application and length of service. We frequently have pans that make 150,000 miles or more without any repairs of consequence. We figure about 15 per cent of the grate area for air openings. I believe it is very important that as much of the opening as possible should be at the side of the firebox. We use the finger rocker grate with dump brake at the rear of firebox, which I believe is the proper place for it. It is much more convenient for fire cleaning and also keeps the dump grate connection rods from under the fire as the rods are liable to burn and cause failures when the dump grate is in the front end of firebox.

Mr. Young: Does the gentleman mean 15 per cent of the grate area, or of the grate opening?

Mr. Elkins: Fifteen per cent of the grate area.

Mr. H. J. Wandberg: We are applying the box grate, and abandoning the dump grates which have caused so many engine failures. If engines must have them they should be placed on the back end of the firebox. The ash pan should be given all the opening possible—not less than 15 per cent of the grate area, but even more if you can.

On many of our engines it is difficult to get a sufficient air opening owing to the firebox being rigid on the frame. To overcome some of that we have cut openings in the side of the hopper and built out what we call a pocket, so that the fire cannot fall out or blow out. In that way we have given it all the opening possible, yet some of our engines lack enough opening.

Mr. T. P. Madden: We have a man here from the Grand Trunk, away over at the other end of the continent, who has given this subject great study—Mr. Monks. I would like to have him tell us about the success had in Canada.

Mr. Monks: I do not know much about the ash pan question. The operating department should know more about engine steaming. At the same time I don't think the 15 per cent ash pan area controls the whole situation in a locomotive. I believe you need enough flues in the locomotive instead of it being plugged up with units and other things to carry off the gases and the smoke that are made by flinging coal on the fire. You can get 15 per cent or more; without tubes to carry it away it will not do any good. We have had to order our waggon-top boilers made straight in order to get more tubes to carry away the gases. That has been an improvement. We put the ash pan down an inch; we have put it down two inches, and yet it didn't steam.

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We have put in perforated plates. We have done everything that could be mentioned. We have put in furrows four inches wide and located the pan so that the air could ascend; we tried all kinds of schemes, but still our engines didn't steam, and we reached the conclusion that the tube area must be great enough to carry off the smoke and the gases that are made by flinging coal on the fire.

Mr. John O. Crites: On our division we have all kinds of ash pans and have experimented on passenger engines with great success. We have a piece of netting 10 to 14 inches wide at each end of the ash pan. The side of the ash pan is cut out six inches wide its entire length and the netting applied. The engine then does a great deal better. Some of our pans are of cast iron. I believe it is a good thing to have all the opening possible in the pan. It will certainly improve the steaming of the engine.

Mr. John J. Mahoney: We use the box grate and dump grates in the back on account of the coal clinkering, and have very good success. With dump grates in the front we had many engine failures.

We cannot get too much ash pan opening. About three months ago we found a few of our engines had only about 10 per cent which was enlarged to 15 per cent with good results. Get all the opening you can for the protection of the fire.

Mr. Monks: On the Grand Trunk system we have adopted a movable lug. In times gone by the lug has been cast on the grate bar, and in taking the bars out and putting them in the lugs would be knocked off. We now have an iron lug put in with a pin. It saves grate bars and we don't have to scrap them as we did before.

Mr. John R. Zureick: We abandoned the dump grate and for three years have used the 11 inch box type with good success. I believe this type is saving the railroads much money in maintenance and fewer engine failures. We give ash pans not less than 18 per cent grate area and as much more as conditions will permit.

The President: The subject is now closed. I would like to ask whether any of you use the electric forge for heating rivets?

Mr. Stiglmeier: We do.

The President: For what size rivets?

Mr. Stiglmeier: We heat them not more than five-eighths of an inch.

Mr. James W. Kelly: I was sent for by the National Tube Company when they were building Eagle boats. They had electric rivet heaters. They heat the rivet too slow to do fast work. When the current is strong the three-eighths and half-inch rivets upset on the point. Unable to get them in they threw them back.

I was surprised to see a gang at the Ford shops, with up-to-date methods, waiting for rivets. In half an hour as many as 10 rivets were thrown back one after the other. I do not think an electric riveter is going to make much of a hit with a railroad company.

MR. B. C. KING: I looked up electric rivet heaters on the Pacific coast while we were engaged in ship-building there. One shop had two forges and after working them a short time they were abandoned. They were not a success.

THE PRESIDENT: The report of the committee on president's address is next.

REPORT OF COMMITTEE ON PRESIDENT'S ADDRESS.

Your committee to whom was referred the President's address, respectfully report as follows:

We first commend the thoughtful character of the address, reflecting as it does a degree and character of interest in the welfare of the Association and its membership, worthy of emulation, that makes for the growth of the organization and the development of conditions calculated to confer lasting benefit upon all concerned.

In all this, as in many other ways it is unnecessary to enumerate, he has added lustre to the unblemished record established as a member and officer of the Association, and furnished an example which not only his successors may well emulate, but every member of the Association as well, and is a demonstration of official devotion to duty, and of the honor bestowed on him by the Association.

G. W. BENNETT, **Chairman,**
T. F. POWERS,
C. E. ELKINS.

The report was adopted.

THE SECRETARY: Mr. J. O. Enochson, Superintendent of Motive Power of the St. Paul, Minneapolis & Omaha, was invited and intended to address the convention. Mr. Borneman has received a letter from him expressing regret that unexpectedly he is detained and cannot make an appointment. He invites the members of the Association to visit the company's shops during their stay in the Twin Cities.

THE PRESIDENT: Next on the program is unfinished business. The report of the Committee on Law was not disposed of yesterday.

REPORT OF COMMITTEE ON

"Law"

Your Committee on Law submits the following for adoption:

Owing to a misprint in the Constitution and By-Laws, as published in the Proceedings of the 1919 convention, it is recommended that the words "such member shall not be required to pay dues" be transferred from Section 4, Article 1 to and at the end of Section 3.

Amend Article VII and insert as Section 2 of that Article the following:

> "The President is authorized, in advance of each annual convention and after the close of the fiscal year, to arrange for and have the books of the Secretary and the Treasurer audited by an accountant in connection with their annual reports, which, if found correct, shall be certified by said accountant for presentation to the annual convention, the accountant at the same time to formally advise the President that the examination has been made and whether he finds the reports of these officers correct."

Amend present Section 2 by striking out the words "auditing by an expert accountant" and changing its number from two to three.

Amend Article XVII further by eliminating present Section 3, as it is covered by a provision in Section 1 of Article XV, which it is recommended be amended by inserting after the word "committee" the words "of three to select special speakers" so that it will then read:

> "appoint a local committee of three to select special speakers and make all necessary arrangements for the convention, and they shall have charge of same."

A. R. HODGES, Chairman
GEORGE W. BENNETT
J. A. DOARNBERGER

MR. G. W. BENNETT: This report consists chiefly of a few changes to be made in the different articles merely to have them read better. Article 7 is changed to authorize the President to appoint committees and to have an accountant audit the books of the secretary and the treasurer.

The report of the committee was adopted.

THE PRESIDENT: The Committee on Resolutions have not reported.

THE SECRETARY: The Committee consists of Mr. A. N. Lucas, chairman, Mr. Louis R. Porter, and Mr. John O. Crites. Their report is as follows:

REPORT OF COMMITTEE ON "RESOLUTIONS"

To the Officers and Members of the Master Boiler Makers' Association:

Your Committee on Resolutions respectfully submits the following for your consideration, and recommend its adoption:

It is with great pleasure that the Master Boiler Makers' Association in the final session of its Twelfth Annual Convention takes this opportunity to acknowledge its obligations to the city of Minneapolis, its Chief Magistrate, its people and its business men, for the happy and perfect way in which they welcomed us to their great and beautiful city of the Northwest, Minneapolis, and take pleasure and highly commend the energetic work of the Minneapolis Chamber of Commerce which in no small measure is responsible for the attainment of results of such practical benefits.

We recognize how the advantages of the city are daily brought to the knowledge of both local and transient interests. The hospitality, courtesy and kindness displayed has impressed our hearts and minds; it serves as an inspiration for still more earnest endeavor on our part to prove our worthiness. It also stimulates our earnest wish for still greater achievement for the advancement of our fellow men, never to lose sight of our responsibility, and our calling, in striving for still higher achievements for the protection of life and property.

These thoughts and sentiments have in part been prompted by the fervent invocation of the Rev. G. L. Morrell of Minneapolis; the eloquent and able addresses of the Hon. J. E. Meyer, Mayor of Minneapolis; Mr. Wm. Schlafge, Mechanical Engineer, Erie Railway; Mr. W. H. Bremner, President, Minneapolis & St. Louis Railway; Mr. A. L. Kipp, Mechanical Superintendent, Soo Line, and Mr. J. M. Hall, Assistant Chief Inspector, Interstate Commerce Commission, for his very interesting illustrated talk on "Boiler Failures and the Results and Cause of Same." We have occasion to refer with pleasure to the Hotel Curtis, and its management, for having insured our comfort, our pleasure and contentment during our brief sojourn here.

To the Boiler Makers Supply Men's Association we are particularly indebted for making us their special guests at all social gatherings and other pleasing events connected with their meetings, especially the very enjoyable trip to Lake Minnetonke, and the untiring efforts of the President, Mr. C. B. Moore, will be long remembered.

In the liberal space given our Proceedings in the daily newspapers of Minneapolis, and in the technical journals, especially the *Boiler Maker, Railway Age, Railway Journal, Master Mechanic*, and many others, further recognition is given to the importance of the position our Association occupies, and the value of its work is substantially attested.

Furthermore, the social side of our convention would be a total loss were it not for the brightness, good cheer and the delight that come from wives and sweethearts in attendance as members of the Women's Auxiliary and their solicitude for our continued success and prosperity.

Recognition is due and is herewith given to the men in official stations who have carried on the business of the Association so intelligently and successfully during the past year. The splendid results of this convention demonstrate that they are the crowning feature of their labor, the proof of duty well performed. In writing our unqualified approval they receive the reward prompted by the confidence and good-will of their fellow members.

Finally, and by no means least, much praise is due the Local Committee of Arrangements for the faithful performance of their responsible duties—good work well done.

A. N. Lucas,
L. R. Porter,
J. O. Crites.

ELECTION OF OFFICERS.

The President: The next subject is the election of officers for the year 1921.

By direction of the President the Secretary read the rule covering the subject.

The President: Is the Association ready to proceed to the election of officers?

Mr. Andrew S. Greene: Is Mr. Patrick eligible for president? Is he an active member now of the Association?

The Secretary: Mr. Patrick is still an active member.

The regular order of business being agreed upon the President appointed as tellers Mr. H. J. Wandberg, Mr. W. H. Laughridge and Mr. A. N. Lucas.

Vice President Young nominated Mr. Charles P. Patrick for President, Mr. J. W. Kelly named Mr. Thomas Lewis for First Vice President, Mr. Patrick proposed Mr. T. P. Madden for Second Vice President, Mr. Bennett named Mr. Young for Third Vice President and Mr. A. N. Lucas proposed Mr. Frank Gray for Fourth Vice President.

There being no opposition these gentlemen were duly elected by the Secretary casting one ballot for each one.

For Fifth Vice President there were four nominees, viz.: Mr. J. T. Goodwin presenting the name of W. J. Murphy, Mr. J. P. Smith that of Capt. Martin Guiry, Mr. Laughridge that of Mr. Thomas F. Powers and Mr. R. C. Gibson that of Mr. George Austin. The ballot resulted as follows:

Mr. Powers	86
Capt. Guiry	55
Mr. Murphy	17
Mr. Austin	12
Total	170

Mr. Powers was declared elected.

Mr. Harry D. Vought was nominated by Mr. Powers for Secretary and Mr. W. H. Laughridge for Treasurer.

There being no opposition the President cast one vote for Mr. Vought and the Secretary one for Mr. Laughridge, both officers being declared duly elected.

To fill the unexpired term of two years of Mr. Powers as a member of the Executive Board, Mr. Longacre nominated Mr. W. J. Murphy and Mr. C. H. Browning by Mr. Laughridge.

Of 111 votes cast Mr. Murphy received 60 and Mr. Browning 51. Mr. Murphy was declared elected.

For member of the Executive Board for three years Capt. Guiry was nominated by Mr. Conrath, Mr. George Usherwood by Mr. Lewis, Mr. B. F. Sarver by Mr. Powers, Mr. Louis R. Porter by Mr. Young and Mr. Wandberg by several members. The result of the ballot was as follows:

Mr. Sarver	58
Mr. Wandberg	58
Mr. Austin	56
Capt. Guiry	43
Mr. Porter	32
Mr. Unsherwood	24

Mr. Sarver, Mr. Wandberg and Mr. Austin (who had been compelled by an official call to return to his headquarters) were declared elected.

ACKNOWLEDGMENTS OF THE SUCCESSFUL CANDIDATES.

The various candidates elected in acknowledging the honor conferred did so in the following order:

PRESIDENT-ELECT C. P. PATRICK.

Gentlemen, I thank you. I am going to be the same to the men of this Association as I have always been. The question of my being an active member came up and I discussed it with several members of the Executive Board. As a result I wish to say that if I did not feel I was an active member, I would not have stood for election. I thank you very much! (Applause.)

FIRST VICE PRESIDENT THOMAS LEWIS.

I cannot express in mere words my appreciation of the confidence you are placing in me year after year. It was six years ago I believe, that I was nominated for fifth vice president. I assure my good friend Mr. Kelly, who has followed me all through, that I appreciate his good will. Twenty years ago a friendship was formed between Mr. Kelly and myself. It has grown, and today I know of hardly any man for whom I would travel as far just to help, or do anything I could. But my appreciation of Mr. Kelly is not less than that held for every individual member of this Association. This Association has been one of the best mediums ever employed for the advancement of the master boiler maker. I have been coming to these conventions for 12 years, always returning from each one feeling better for being connected with such a body of men.

One of the speakers told us yesterday that the master boiler maker was indeed a craftsman. Whether that is so or not, the master boiler maker, in importance in his own line of work, if not more than any other man, stands just as high as any other mechanic connected with the railroad systems of this country; and I believe it is this organization that has made him so.

I thank you, gentlemen, for the confidence you have given me today and hope, as the years come and go, that confidence will be merited by my actions and by my life. (Applause.)

SECOND VICE PRESIDENT MADDEN.

I wish to thank you for the honor you have conferred on me this morning. I will do my best to discharge the duties of this office, and experience great pleasure in being elected. (Applause.)

THIRD VICE PRESIDENT YOUNG.

You fellows have been making so much racket about the third, I'll be hanged if I know whether I am elected or not! (Laughter and applause.) I am not going to make a speech, because I have told you fellows so often who you are and the part you are playing in the industrial world. If I live long enough (and I hope I do), if you permit me to reach the place Mr. Tate occupies, perhaps I will have something to say to you. Next to my wife the boiler makers will always be dear to me, and they all know that. I thank you very much, every one of you!

THE PRESIDENT SPEAKS FOR VICE PRESIDENT GRAY.

In the absence of Mr. Gray, the President said:

"In a communication which the Secretary read a few days ago Mr. Gray explained why he could not be with us. But I can fully express his gratification in receiving the favor of this Association. I know you have not made any mistake in electing Mr. Gray Fourth Vice President."

VICE PRESIDENT POWERS.

After that ball game yesterday I am not in very good condition to talk. (Laughter.)

But, gentlemen, it gives me exceptional pleasure to be elected Fifth Vice President, especially in the city of Minneapolis, because I am a product of Minnesota. I was born and raised 105 miles south of the city of Minneapolis, served my time and was married there. The confidence you have shown in me is appreciated and I will try to honor the office, hoping at some future time to honor it more highly than now. I thank you. (Applause.)

SECRETARY VOUGHT.

Mr. President (I wish I could say Fellow Members), and gentlemen of the convention: You know there is a familiar song, probably every man has heard it, "The Old Old Story," and in a quiet way you have just sung it. Thank you! (Applause.)

TREASURER LAUGHRIDGE.

Thank you, gentlemen, for the confidence you have bestowed upon me. I guarantee that unless you get more money in the treasury I will not run off with it! (Laughter and applause.)

EXECUTIVE MEMBER MURPHY.

One of the greatest honors that a boiler maker can have is to become an officer of this Association. I assure you my best efforts will be devoted to promoting the good of this Association at all times, and I am always ready to do anything that I can for the members.

EXECUTIVE MEMBER WANDBERG.

When you ask me to make a speech I assume you are ready to leave through that door (indicating); so I am not going to attempt it. I will do everything in my power to perform the duties of a member of the Executive Board. I thank you very much.

NEW BUSINESS.

The Executive Board presented the following report, which was approved:

REPORT AND RECOMMENDATIONS OF EXECUTIVE BOARD.

Minneapolis, May 24, 1920.

To the Officers and Members of the Master Boiler Makers' Association:

Gentlemen: At a meeting of the Executive Board held today it was agreed to recommend to the Committee on Law when appointed that Section 1 of Article III of the Constitution and By-laws be so amended as to more clearly define eligibility of members for election as officers of the Association.

It was decided that any member of the Association who has been in military service during the late war is exempt from the payment of dues for the period of such service and the Secretary was instructed to refund any money received from such members, as per instructions of 1920 convention.

The Board wishes to call the attention of members of the Association to Section 2, Article X of the Constitution and By-laws relative to eliminating from the published Proceedings any papers or reports advocating personal interest. In view of the power thus vested in the Board two reports covering Topics 8 and 9 were ordered stricken from the convention program because they conflicted with the fundamental law of the Association in the manner indicated, and the policy of the Association observed in the past of not discussing patented articles or devices which were of personal interest.

Unfortunately at the past two conventions the rules in question have not been observed and as a result there has been much criticism. The Board therefore finds it necessary to rule that hereafter topics for discussion which have the effect of advocating personal interest and being used as an advertising medium will not be permitted. The cooperation of all members is asked for the observance of the restriction in question.

The Secretary was instructed to omit from the published Proceedings all half tone portraits and superfluous matter on account of the excessive cost of production.

J. F. Raps, Chairman,
E. J. Reardon, Secretary.

Mr. J. W. Kelly: I move that a committee of three competent and conservative members of this organization be appointed to visit different railroad shops on electric and acetylene welding, especially shops claiming so much success; this committee to get up a set of questions to be put to every member that they call upon, with respect to all kinds of welds—flues, door hole patches, and everything that was discussed here thoroughly. Also that their expenses be paid, either by the railroad companies they represent, or this organization.

Mr. Wandberg: I second that motion.

President Tate: Gentlemen, I wish to make a few remarks on that motion before we get too far with it. That is a very big job. I don't think any railroad company would be willing to give their foreman a year's vacation; that is just what it means.

It will take a man a year to go over the United States. I was out 10 weeks, and visited 52 shops: not because I was slow, because the men with me and myself worked hard. This Association could not afford that. On such a proposition a committee of less than five should be ordered.

The spirit of the idea, when first broached to the Association, was that we have a committee to meet the committee of the Welding Society and the Mechanical Engineers' Association, at their joint meeting wherever that may be held. But as I said before, it devolves upon the Association to say just what shall be done.

This is a day of non-production, and I think every man ought to be right on his job, getting all the production he can; if we relieve five men for this it means five fewer men on the job of production; but to have a committee meet these associations, that would not be a very hard job.

Mr. Kelly: I think you have taken a wrong view of my motion. I don't think we want to send these men to sit in the lobby of a hotel and talk about what they *think*. I want them to get on their overalls, and see what is being done. If these railroads are as successful as stated they can then bring back a report and tell just what they found. They don't have to go to 100 shops—10 or 15 shops would be enough; make that a short, quick trip, and then get back to business.

Mr. Wandberg: That is just the idea I had of Mr. Kelly's motion. Whoever this committee may be we can get from our record the names of the shops and where they are located.

I didn't hear all of the discussion yesterday, but from what little I heard less than 50 per cent of the men are successful and doing good welding. For this reason I don't think that, as Mr. Kelly says, more than 10 or 15 shops at the outside are doing 100 per cent welding. I don't believe in visiting every shop in the United States. Most all of the leading roads in these United States can be reached out of Chicago in 10 or 12 hours, and all the information wanted obtained.

Mr. R. W. Janes: I don't believe there is a member present that would expect remuneration for going out in search of something beneficial to himself as well as to all concerned. I feel that five thorough, competent men can be selected here, who would be willing to go out during the coming year and get all the information that could be obtained from the points where they report success has been had in welding. Every man present is vitally interested in the welding that has been going on and I would not be in favor of remunerating any committee to go out and search for information that is a benefit to themselves. I think you will all agree that in the last four or five conventions electric and acetylene welding has been a pertinent question. I have known men in our conventions have told us what they were doing and when I visited their shop I could not get confirmation of their statements. More of practical value was said by Professor Kinsey in a few minutes yesterday than has been said in the convention in the last five years; and I believe Mr. Kelly's idea a good one because the question of welding is one of the broadest before us today.

It is not only a broad question, but it is the biggest confronting your craft. That assertion is based upon the opportunities your Secretary has through other connections to know what is going on. This question is certain to be the subject of legislation, possibly in Congress. You will hear from it through the I. C. C. You are progressive—you are ambitious—and you want to be up to date. In the number of years you have been kind enough to give me the privilege of representing you in this office, no question of equally absorbing interest, not only for the Association collectively, but for the individual membership, has come up in your annual convention. Therefore please permit me to urge, with all the force which can be summoned, that you keep step with the march of progress—and very close up to the band wagon. If necessary get on the wagon.

A MEMBER: Yes: get IN it, and lie in it!

THE SECRETARY: Professor Kinsey is one of several gentlemen actively identified with affairs in the American Society of Mechanical Engineers, and a new and very important growing organization, The American Welding Society, the influence of which will soon be felt in a significant way owing to the magnitude and character of interests back of it.

They have a joint committee, and Professor Kinsey in talking with me night before last and yesterday said:

"I hope the boiler makers, in their enthusiasm and their absorbing interest in this question, will not hesitate to have a committee meet with us, to hear what we have to offer, to cooperate so far as they are authorized to do so and to come back to this Association one year hence with something of an important character. Then every member will know what is going on—not only those in the convention, but those who never get to a convention, who will want to know and who will get it in the Official Proceedings."

All this is not only to stimulate you to right action, but to support the suggestion of Mr. Kelly and Mr. Janes. If a committee is appointed as contemplated, it should have authority to meet with the committees representing the A. M. E. and the Welding Society. They will have a report at next year's convention of far-reaching importance. It will probably mean that an entire day and perhaps more will have to be given to this subject; but what of it? With all the good things named in the report of the Committee on Topics which you agreed upon, no other subject will take as much of your time, and will mean so much for the future of every member of this Association in his work, in his authority, in his supervision, and the doing of the entire duty for which his company employs him. (Applause.)

MR. P. J. CONRATH: I wish to suggest that this committee select six of the largest railroads in the country that are doing the largest amount of welding, and confine their efforts and researches to these. Also that they confer with the American Society of Mechanical Engineers, the A. S. G. M. Society, the American Society for Testing Materials and the American Welding Society. They can get much information which will be very valuable to this Association. By working together they will eventually solve the problem, and make a good report to our next convention on which to base a conclusion.

MR. KELLY: I think Mr. Conrath's suggestion is all right; and any other suggestions. The point I make is that we never get anywhere. We come here and discuss the subject from time to time, and one man said of another, "He is not telling the truth." Now I know that these fellows would not come here and say they were making a success of welding in their shop, if it were not true. I know that nearly everything I did well I learned from someone else. I saw how he was doing it, and I went and did it. I would like Professor Kinsey to take the floor and give us a little talk.

PROFESSOR KINSEY: I think on the joint committee should be a man like Mr. Pack of Washington, or his assistant, Mr. Hall. This would give us the benefit of their experience with fusion welds. One thing we would want to know is what is the best kind of weld to make in a firebox where there is bad water. This could be obtained from members who have had alkali experiences in the west. The men from the east couldn't tell you. There are no alkali troubles there to speak of. We would like to bring into our next meeting all of this information to get it ready to report in the month of December to the American Society of Mechanical Engineers. Thank you, Mr. President, for permitting me to have the floor.

THE SECRETARY: I did not know the Professor was in the house. If I had I would have kept still.

The motion to appoint a special committee of five was carried.

MR. KELLY: Another matter brought to my attention several times is the absence of a printed registration list of boiler makers attending this convention. We have one here you haven't seen in 25 years. Mr. Conrath told me who he was—Buck Brennan! He had changed so much I did not recognize him. When attending meetings in Chicago he always sits in the back seats. I think this convention ought to have a daily registration, and I offer a motion to that effect.

THE SECRETARY: We have not had a printed convention registration in several years. Formerly it was provided by the Supply Men's Association. It might be issued late on the second day—say toward evening, but hardly at the opening of the session unless a job printer could be found who would get it up at night; but that would make it more expensive. It all depends on where the next convention is held, and the local committee of entertainment would have to arrange for it. Nevertheless I concur in Mr. Kelly's proposition.

The motion was unanimously carried.

THE PRESIDENT: Gentlemen, as my term has about expired, I will introduce my successor, Mr. Patrick. I wish him great success, and the sympathy of the Association, and I think that you will find him a number one fellow. I wish him Godspeed.

Mr. Tate, the retiring president, then surrendered the gavel to Mr. Patrick, the president-elect, amid the applause of the convention.

Mr. Patrick: Thank you.

Mr. Patrick then took the chair.

President Patrick: Mr. Wagstaff, have you anything to do this afternoon before we adjourn?

PRESENTATION TO PAST PRESIDENT TATE.

Mr. Wagstaff: You do not know what pleasure it gives me to have an opportunity to say a few words this morning. You know I am one of the old guard: and it is with very great pleasure indeed that I watch the growth of this organization. I am very proud of the number of fine young fellows who are backing up the old guard.

You know we can look back and see the progress that has been made, and it is pretty hard to make us old timers believe you young fellows are any better than we are—or than we would be. For one I am very proud that I am giving way to such a lot of fine young fellows.

But I have a more important duty to perform here this morning than using a little camouflage. On account of the lateness of the hour, and the turbulent feeling in the meeting just now, I believe it best to curtail any speech I have and get down to business. I am reminded of the convention we had in Chicago when the two organizations were consolidated. Everybody was happy and they called on Charles L. Hempel for a speech. Mr. Hempel could not see why they called on him as long as "Abe" Lucas was in the audience. Mr. Lucas took the platform and simply stated that he did not see why they should call on him as long as George Wagstaff was present. All I could do was to rise and ask the boys to give three big cheers for the consolidation; and after I pin this badge on Mr. Tate, I will ask the audience to rise and give three cheers for the retiring president, Mr. John B. Tate. If you get as much pleasure out of wearing this as I get out of wearing mine, you will be a very happy man! Now, gentlemen, rise and give three good round cheers for John!

(This was done.)

Mr. Wagstaff: Thank you, gentlemen.

Mr. Tate: Gentlemen, it is very hard to respond to that man. (Laughter.) I have been trying it for about 20 years, and every time he gets it on me, pure and simple. I presume if you people come in contact with him as much as I have, why, you will find out he is no ordinary fellow—particularly in some places after 10 o'clock at night! (Laughter). I thank you very much, gentlemen, for the honor I have had of serving the Master Boiler Makers' Association as their President.

Mr. George W. Bennett: In January I was on a committee on welding at Washington, and we got up some rules. They have not been adopted yet; but I think they will be.

A Member: Go up and get them!

(Mr. Bennett read the rules.)

Mr. Bennett (continuing): I presume some day with some changes these rules might be put in force. If they are all welding on longitudinal seams 15 inches down from the top of the crown sheet will be cut out. If you want to weld in a crown sheet, why it will be necessary to lap it at the back head and flue sheet, and weld it on both sides. Tests we have made demonstrate the fact that those welds are much stronger than the other type—than the one weld.

Mr. Young: Then that practically means that in placing a new crown sheet in an old firebox, it is not connected up with rivets on the end?

Mr. Bennett: No—you can rivet it, but it must be lapped and welded on both sides.

Mr. Powers: Will that same condition apply to a patch applied on a crown sheet?

Mr. Bennett: Yes. No weld will be allowed on a crown sheet within 15 inches of the top of the crown sheet. You will have to lap it and rivet it.

A Member: Has that come before the railroad men, or is it just a proposition to be submitted to them?

Professor Kinsey: Those rules were written by Mr. Pack of Washington months ago. I was assured by him that he would not make recommendations to the Interstate Commerce Commission to put these rules into effect for a long time to come, knowing that in the meantime these organizations would come together. The rules to which you refer are taken almost entirely from the American Society of Mechanical Engineers' boiler code but they are not final. There are only certain things about them that apply. As it stands now there is nothing whatever in those rules to affect your work. They have not been acted upon. They have no authority so far.

A Member: Just one more question. If we have a crack in a crown sheet from one radial stay to another, will that prohibit welding that crack?

Mr. Bennett: That is what the rule says.

Mr. Powers: I do not believe anyone wants to eliminate anything that will cause loss of life more than I do but I think, if the Commission is forced to adopt a set of rules such as have been read here, that it will set welding back to where it was 10 years ago. I believe some boiler men went too far in welding but two wrongs do not make a right. I believe that probably there are things we should not do with the crown sheet, but there is no question in my mind that if the weld is properly made it is safe in any staid portion of a firebox.

One thing that we must bear in mind is that with the railroads in their present condition, the shortage of men, the labor situation and the shortage of material, many of the railroads are unable to take care of their locomotives and that a law prohibiting any welding regardless of what the competent boiler foremen think, will put the railroads out of business.

The President: Any further general discussion?

The Secretary: Nothing on the Secretary's docket, Mr. President.

The President: Has anyone anything to say for the good of the Association? If not we have reached "announcements and closing exercises of the convention."

The Secretary: Nothing further, Mr. President. A motion to adjourn would be in order.

Mr. Young: If there is nothing further I move we adjourn.

Motion carried and adjournment taken at 12.50 P. M.

WHOSE SPECTACLES?

The Secretary has a pair of gold spectacles which were lost at the convention at Chicago in 1919 supposedly by a member from Birmingham, Ala., which the owner can recover on properly proving property.

NEW MEMBERS ENROLLED SINCE 1919

ACTIVE

Albert, Jacob, Asst. Boiler Foreman, C. & W. I. R. R., 51st Shops, Chicago, Ill.

Bieser, C. J., Boiler Foreman, St. L. & S. W. R. R., 216 Gold St., Tyler, Tex.

Blaney, R. J., B. M. F., C. & N. W. R. R., 364 Frank St., Huron, S. D.

Bono, Calvin M., Boiler Foreman, C. M. & St. P. R. R., Box 721, Molindge, S. D.

Bove, Jas., F. B. M., N. Y. C. R. R., Binster, N. Y.

Browning, Percy, B. M. F., Penn. R. R., Shops, Canton, O.

Bingan, E. R., B. M. F., Northern Pacific R. R., 1531 Lyndale Ave., Helene, Mont.

Christianson, J., B. S. F., C. M. & St. P. R. R., 832 Maple Ave., Green Bay, Wis.

Clas, John A., Gen. F. B. M., N. Y. C. R. R., 20 Stephen St., Albany, N. Y.

Codden, John C., Boiler Insp., G. N. R. R., Superior, Wis.

Derrig, Peter, Boiler Foreman, G. N. R. R., 116 Lyton Place, St. Paul, Minn.

Donahue, Thomas P., Asst. F. B. M., N. Y. N. H. & H. R. R., 4 Day St., Norwood, Mass.

Erickson, M. B., Boiler Foreman, C. M. & St. P. R. R., Austin, Minn.

France, Myron C., Boiler Insp., C. St. P. M. & Omaha Ry., 57 B Piedmont Apt., St. Paul, Minn.

Hagan, Geo. N., F. B. M., Erie R. R., 235 Blain Ave., Marion, O.

Hutchinson, Geo. B., Boiler Foreman, C. M. & St. P. R. R., P. O. Box 94, Spirit Lake, Idaho.

Jennings, Gilmore, Gen. Boiler Foreman, B. & O. R. R., 513 Sycamore St., Washington, Ind.

Jones, G. J., Gen. Boiler Foreman, B. & O. R. R., New Castle, Pa.

Lacerda, Harry A., Insp. of Boilers, U. S. Shipping Board, 2358 Hudson Blvd., Jersey City, N. J.

Laysek, Theo., Boiler Foreman, G. N. R. R., Havre, Mont.

Litz, Franklin T., Gen. Boiler Foreman, C. M. & St. P. R. R., 3601 Parkhill Ave., Milwaukee, Wis.

McNeil, D. L., Gen. F. B. M., G. M. Standifer C. Co., 688 E. Oak St., Portland, Ore.

Mackeroth, W., Boiler Insp., G. N. R. R., 408 Wach St., Minot, N. D.

Maher, E. J., B. M. F., Northern Pacific Ry., 2026 W. 2nd St., Duluth, Minn.

Medinger, M. L., F. B. M., C. M. & St. P. R. R., Sioux City, Ia.

O'Keefe, James, B. F., C. M. & St. P. R. R., 533 N. 4th St., Montevideo, Minn.

Pable, Charles, Boiler Foreman, C. & N. W. Ry., 327 Bortlett Ave., Milwaukee, Wis.

Potts, David W., F. B. M., Illinois Central R. R., Centralia, Ill.

Rahan, F. E., Boiler Foreman, O. W. R. & N. R. R., La Grande, Ore.

Sampson, F. C., B. M. F., B. & O. R. R., Cumberland, Md.

Scholl, H. J., B. M. F., Northern Pacific Ry., 2207 6th St., N., Minneapolis, Minn.

Seaburg, A., B. M. F., Northern Pacific Ry., 303 S. H. St., Livingston, Mont.

Seaburg, Nels, B. M. F., Northern Pacific Ry., 106 16th St. N., Fargo, Minn.

Service, John, F. B. M., C. & N. W. Ry., 1625 Ainslee St., Chicago, Ill.

Simons, W. J., Boiler Foreman, C. G. W. Ry., 128½ E. Winnifred St.,

Smith, James T., B. M. F., C. M. & St. P. R. R., 809 3rd Ave., S. W., Aberdeen, S. D.

Smith, F., B. S. F., Kansas City Southern Ry., 1809 N. Locust St., Pittsburg, Kans.

Swarmer, C. C., B. M. F., C. & N. W. R. R., 543 W. Midwest Ave., Casper, Wyo.

Tulin, Tad P., Asst. F. B. M., Erie R. R., North Side Shops, Jersey City, N. J.

Ward, Chas., Boiler Foreman, N. Y. C. & St. Louis R. R., Conneaut, O.

ASSOCIATE

Aiken, C. H., Special Field Rep., Falls Hollow Staybolt Co., 740 E. 126th St., Cleveland, O.

Housley, J. P., Rep., Housley Flue Con. Corp., 2760 Roosevelt Ave., Indianapolis, Ind.

Peabody, R. T., Sales Asst., R. R. Dept., Air Reduction Sales Co., 120 Broadway, New York City.

Renno, Paul C., Rep., Niles-Bement-Pond Co., 111 Broadway, New York City.

Constitution and By-Laws

AS AMENDED 1908-1909-1911-1913-1915-1919-1920

ARTICLE I.

NAME.

"Master Boiler Makers' Association."

ARTICLE II.

The object of this Association shall be the mutual improvement of its members by an exchange of ideas in meetings, the reading and discussion of papers, and a general interchange of views, so that all may profit by the experience of others more proficient in our craft.

ARTICLE III.

SECTION 1.—The officers of this Association shall consist of a President, First, Second, Third, Fourth and Fifth Vice-Presidents, who shall be active Master Boiler Makers, Assistant Foremen or General Boiler Inspectors and engaged as such at the time of election; a Secretary and a Treasurer.

SEC. 2.—The office of President, First, Second, Third, Fourth and Fifth Vice-Presidents, Secretary and Treasurer shall be elective at the annual convention.

SEC. 3.—The election of officers of the Association shall be by ballot. They shall be elected separately, and a majority of all votes cast shall be necessary for choice.

SEC. 4.—Only active members in good standing shall be allowed to ballot for officers.

ARTICLE IV.

EXECUTIVE BOARD.

SECTION 1.—There shall be an Executive Board, to consist of nine (9) members.

SEC. 2.—The Executive Board shall be elected by ballot, said Board to elect their chairman to serve during the time of his incumbency, each elected member to serve three years.

ARTICLE V.

DUTIES OF THE PRESIDENT.

It shall be the duty of the President to preside at all meetings of the Association; to appoint all committees; decide all points of ardor; receive and submit all motions duly made by the members; put to vote all motions regularly made, announcing the results, and voting only in case of a tie; and he shall exercise general supervision over the affairs of the Association.

ARTICLE VI.

DUTIES OF THE VICE-PRESIDENT.

The Vice-President shall assist the President in such duties as he may require; and in the absence of the President shall preside at the meetings of the Association and perform all the duties of the office in their order.

ARTICLE VII.

DUTIES OF THE SECRETARY.

It shall be the duty of the Secretary to keep a correct record of all meetings of the Association, attend to correspondence, keep a record of the membership, receive all moneys and remit the same at stated intervals to the Treasurer, take charge of all books, papers and other property, and perform such other duties pertaining to his office as may be required of him by the Association.

ARTICLE VIII.

DUTIES OF THE TREASURER.

It shall be the duty of the Treasurer to receive and receipt for and safely deposit in a bank all moneys belonging to the Association; he shall keep a correct record of all moneys received, and submit to the President, Secretary and Chairman of the Executive Board, a quarterly statement of the condition of the treasury, showing the balance on hand at the previous report, the amount received and disbursed since the last report, together with the balance on hand; and shall pay out no moneys except on a voucher drawn by the Secretary and approved by the Chairman of the Executive Board.

ARTICLE IX.

BOND OF OFFICERS.

The Secretary of this Association shall be bonded by a Security Company for the sum of $1,000. The Treasurer shall be bonded for the sum of $2,000. The expense thereof shall be borne by this Association. The Executive Board shall be the custodian of the bonds.

ARTICLE X.

DUTIES OF THE EXECUTIVE BOARD.

SECTION 1.—The Executive Board shall exercise a general supervision over the interests of the Association; to call, to prepare for and to conduct annual conventions; to make all necessary purchases, expenditures and contracts required; to conduct the current business of the Association.

They shall have no power to make the Association liable for any debts to an amount beyond that which at the time of contracting the same shall be in the Treasurer's hands in cash and not subject to prior liabilities; all expenditures shall only be made by appropriations acted upon by the Executive Board.

SEC. 2.—The Executive Board shall make a report of the proceedings of each of its meetings, such report to be made accessible to all members of the Association. It shall have the proceedings of the regular meetings of the Association published, subject to the instructions from the latter. It shall have the power to withhold from the published proceedings, papers and reports containing old matter readily found elsewhere, those especially meant to advocate personal interests, those carelessly prepared or controverting well-established facts, and those purely speculative or foreign to the purpose of the Association, or any which in the opinion of the Board are unworthy of Publication.

SEC. 3.—Two-thirds of the members of the Executive Board may call special meetings of the Association, to be held not less than thirty days after notice thereof has been mailed to each member of the Association.

SEC. 4.—The Executive Board shall have power to change the place of meetings if deemed necessary for the best interests of the Association.

ARTICLE XI.

MEMBERSHIP.

SECTION 1.—*Active Members* shall consist of Master Boiler Makers, Assistant Foremen and General Boiler Inspectors who are practical boiler makers, and filling such position at time of application.

Any subsequent change in their occupation or position, unless entirely foreign to the trade of boiler making, shall not affect their status in the Association, and they shall remain active members thereof during the time that they retain their membership and conform to all the rules and regulations of the organization.

Applicants for active membership shall submit their request in writing, give name in full and name and address of the road or company by which they are employed.

Applications for active membership must bear the signatures of at least two members of the Association in good standing.

SEC. 2.—*Associate Members* shall consist of men who have served as Master Boiler Makers, or others whose experience will be valuable to the Association. Such members shall not have the privilege of voting.

SEC. 3.—*Honorary Members* shall consist of those who have served as active members and on account of old age or ill health have been obliged to retire from active service, or others who will be valuable to the Association; such members shall not be required to pay dues.

SEC. 4.—Applications for membership may be approved by the Chairman of the Executive Board during "recess" periods of the Association but must be finally ratified at the next annual convention by the Association.

ARTICLE XII.

FEES AND DUES.

SECTION 1.—The initiation fee in this Association shall be Three Dollars ($3).

SEC. 2.—The Annual dues shall be Two Dollars ($2) per year, payable in advance on April 1st of each year.

SEC. 3.—The initiation fee of $3 shall accompany each application for membership. Dues payable as per Section 2 of this Article.

ARTICLE XIII.

MEMBERS IN ARREARS.

Members in arrears for dues may occupy seats in the convention, but they shall not be entitled to vote or take part in any discussion, nor in the transaction of any business brought before the convention, until such arrears are paid; and after the expiration of one (1) year the Secretary shall notify such members that they will be suspended for non-payment of dues unless their arrearage is paid within thirty (30) days after such notice has been given. Members shall not be entitled to receive a copy of the published proceedings of conventions unless their dues have been paid as required by the Constitution and By-Laws.

ARTICLE XIV.

Any member of this Association may at any time withdraw from this Association by making application for a withdrawal card which will be granted provided his dues are paid for the year in which application is made and which can be deposited at any time thereafter he desires by paying one ($1.00) dollar, the application being subject to Section 4 of Article XI. of this Constitution.

ARTICLE XV.

MEETINGS.

SECTION 1.—The place for each annual meeting shall be fixed at least six months before the annual meeting by the Executive Board, to which all invitations therefor shall be sent by the Secretary to the Chairman of the Board. The Board shall also at the same time decide upon the days and hour of assembly, and when determined shall at once notify the Secretary of the same and the Secretary shall mail to each member not later than 60 days in advance of such annual meeting, notice of the place, date and hotel rates, with such other information concerning the arrangements as may be in his possession. Immediately after the place and time have been fixed the President shall appoint a local committee of three to select special speakers and make all necessary arrangements for the convention, and they shall have charge of same. The convention shall continue four (4) days, with daily session from 9 A. M. to 1 P. M., these hours, however, to be subject to change as circumstances may make necessary, and the convention may determine by a majority vote of the members present.

ARTICLE XVI.

COMMITTEE REPORTS FOR ANNUAL CONVENTIONS.

SECTION 1.—The President shall within 30 days following his election appoint a committee of three for each topic to report at the next annual convention on such topics as are adopted for that occasion, and also a committee of three to report a list of subjects in advance for the next succeeding annual convention.

SEC. 2—The reports of all standing and special committees must be in the office of the Secretary not later than March 1st in order that the same can be printed and advance copies issued by April 1.

Such reports shall be prepared for printing and presentation to the convention by the Chairman of each Standing or Special Committee to whom each member of a Committee shall send, not later than January 1st, his individual report, such individual report to be read before the convention if desired or called for, but only the report printed shall be included in the published Proceedings of the convention, unless such individual report, or a minority report of the Committee, shall be adopted by a majority of the convention in place of the majority of the Committee.

Each Chairman of a Committee shall promptly submit the report prepared by him to his associates on his Committee and obtain their concurrence, amendment or rejection, a majority of the members concurring to govern in the final adoption of the report for presentation to the Convention.

Committee reports which do not reach the Secretary in time for printing and issuing by April 1st, will be referred to the Executive Board to decide whether the report shall be submitted to the Convention.

The Chairman of Standing and Special Committees will read an abstract of the report of the Committee before the Convention, together with whatever additional data may have been accumulated after April 1st, to the date of the Convention.

The members of Standing or Special Committees, who may individually or collectively submit a minority report, must prepare the same so that it can be issued with the report of the majority of the Committee, to substitute for the majority report in the event the Convention should so decide.

Each member of a Standing or Special Committee shall sign either the majority or a minority report.

SEC. 3.—*Quorum.* Nine members at any meeting shall constitute a quorum for the transaction of business, but any less number shall have power to adjourn to any time and place they may deem proper.

ARTICLE XVII.

SECTION 1.—There shall be a standing committee on law to consist of three members to be appointed by the President after assuming the duties of his office and said appointments shall include at least one member of such committee who served in such capacity during the year preceding an annual convention of the Association.

SEC. 2.—The President is authorized, in advance of each annual convention and after the close of the fiscal year, to arrange for and have the books of the Secretary and the Treasurer audited by an accountant in connection with their annual reports, which, if found correct, shall be certified by said accountant for presentation to the annual convention, the accountant at the same time to formally advise the President that the examination has been made and whether he finds the reports of these officers correct.

SEC. 3.—At the first session of each annual convention the President is authorized to appoint for the period of such convention the following committees, and additional committees which circumstances may make necessary for the time the Association is in session:

President's address,

Memorials,

Resolutions.

ARTICLE XVIII.

AMENDMENTS.

No article or clause to the foregoing Constitution shall be altered, amended or repealed except at an annual meeting and then only by a two-third (2-3) vote of the members present.

ARTICLE XIX.

ORDER OF BUSINESS.

1. Roll call.
2. Report of Officers.
3. Report of Committees.
4. Unfinished Business.
5. New Business.
6. Election of Officers.
7. Appointment of Committees.
8. Adjournment.

MEMBERSHIP LIST

IMPORTANT NOTICE TO MEMBERS

Those whose names do not appear in this list will understand that they are in arrears for dues to and including 1920, and are suspended from membership until the amount due is paid as provided by the penalty clause of the Constitution and By-Laws, official notice having been mailed to their last known address.

If your name is wrongly spelled or the address given is not correct, please notify the Secretary at once that errors may be corrected in Index Card system which has been installed in place of a book record. Also kindly give immediate notice of any future change in your title, business connection or post office address.

HONORARY MEMBERS

Duntley, J. W., Union League Club, Federal St. & Jackson Blvd., Chicago, Ill.

Duntley, W. O., Pres., Duntley-Dayton Co., 1416 Michigan Ave., Chicago, Ill.

Lape, Charles F., Scully Steel & Iron Co., 104 Stimson Block, Los Angeles, Cal.

McManamy, Frank, Mgr., Division of Liquidation Claims, U. S. R. R. Administration, Washington, D. C.

Pack, A. G., Chief Insp., Loco. Boilers, I. C. C., Washington, D. C.

Pratt, E. W., S. M. P., C. & N. W. R. R., 215 N. Oak Park Ave., Oak Park, Ill.

ACTIVE MEMBERS

Ainslie, P. C., F. B. M., Canadian Pacific Ry., 1158 First Ave., N. W., Sask., Canada.

Akins, A. A., F. B. M., C. G. W. R. R., 115 E. Isabelle St., St. Paul, Minn.

Albert, Jacob, Asst. Boiler F., C. & W. I. R. R., 51st St. Shops, Chicago, Ill.

Albrecht, F. H., B. F., Mobile & Ohio R. R., 407 S. 16th St., Murphysboro, Ill.

Albrecht, J. A., F. B. M., N. Y. Central R. R., 40 Hubbell Ave., Buffalo, N. Y.

Anderson, Andrew, Gen. B. Insp., D. & R. G. R. R., 970 S. High St., Denver, Colo.

Anderson, J. A., Gen. F. B. M., Industrial Wks., 216 N. Madison Ave., Bay City, Mich.

Andrich, Fred, B. F., A. T. & S. F. Ry., General Delivery, Amarillo, Tex.

Ardis, L. T., Foreman, Boiler Dept., P. B. & W. R. R., 225 W. 30th St., Wilmington, Del.

Armshaw, Herbert, Boiler F., C. P. Ry., General Delivery, Nelson, B. C.

Ashback, Joseph O., Box 224, Deer Lodge, Mont.

Atkinson, William B., F. B. M., M. & N. A. R. R., 319 Vine St., Harrison, Ark.

Austin, George, G. B. I., A. T. & S. F. R. R., 6 Devon Flats, Topeka, Kans.

Bader, Cornelius, F. B. M., M. C. R. R., 737 Military Ave., Detroit, Mich.

Badger, R. L., Supv. Boilers, Erie R. R., c/o C. James, Mech. Supt., Hornell, N. Y.

Bailey, G. G., F. B. M., N. Y. C. R. R., 120 Lake Shore Ave., Toledo, Ohio.

Baird, A. M., V. P., P. Baird Pneumatic Tool Co., 718 Monroe St., Kansas City, Mo.

Barnes, W. R., Chief B. I., C. of G. R. R., 563 Oak St., Macon, Ga.

Batchman, F. A., F. B. M., N. Y. Central R. R. Co., 1421 Krau St., Elkhart, Ind.

Baty, C. E., Mech. Rep., Perolin Co. of Am., 2502 W. Travis St., San Antonio, Texas.

Baumann, C. J., F. B. M., N. Y. N. H. & H. R. R., 305 Howard Ave., New Haven, Conn.

Bayer, Fred, F. B. M., P. C. C. & St. L. Ry., 410 St. Clair Ave., Columbus, Ohio.

Beck, John F., F. B. M., G. R. & I. R. R., 426 Thomas St., Grand Rapids, Mich.

Becker, J. B., G. B. M. F., So. Pacific Ry., 1435 Hopkins St., Berkeley, Cal.

Beland Arthur J., G. F. B. M., Chicago Jct. R. R., 7346 Kenwood Ave., Chicago, Ill.

Bell, W. D., F. B. M., Southern Ry., 4325 Ave. B South, Birmingham, Ala.

Bennett, C. R., B. M. F., Penn. R. R., 1821 Market St., Logansport, Ind.

Bennett, G., Foreman, Boiler Shop, Penn. R. R., P. O. Box 382, Verona, Pa.

Bennett, G. W., Dist. Insp., I. C. C., 15 Kent St., Albany, N. Y.

Berrey, Frank E., F. B. M., Erie Railroad, 5315 Julia Ave., Cleveland, O.

Berry, John, Boiler Insp., Grand Trunk R. R., 172 Fern Ave., Toronto, Ont., Canada.

Best, J. B., F. B. M., N. P. R. R., Box 92, Staples, Minn.

Bieser, C. J., Boiler Foreman, St. L. & S. W. R. R., 216 Gold St., Tyler, Texas.

Billington, Matthew, F. B. M., B. R. & P. R. R., 72 Central Ave., E. Salamanca, N. Y.

Blaney, R. J., B. M. F., C. & N. W. Ry., 364 Frank St., Huron, S. D.

Bleick, W., G. F., G. H. & S. A. R. R. Shops, El Paso, Texas.

Bliss, George, F. B. M., N. Y. C. R. R., New Durham E. H., New Durham, N. J.

Blount, Frank C., F. B. M., Southern Ry., 1101 N. 23rd St., Richmond, Va.

Boaman, John P., 5830 Trinity Place, Philadelphia, Pa.

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INDEX TO ADVERTISERS

	OPPOSITE PAGE
Air Reduction Sales Co.	78
American Arch Co., Inc.	60
American Flexible Bolt Co.	69
American Locomotive Co.	57
Boiler Maker (The)	81
Brubaker & Bros. (W. L.)	58
Burden Iron Co. (The)	53
Camden Iron Works	54
Chambersburg Engineering Co.	79
Champion Rivet Co. (The)	74
Chicago Pneumatic Tool Co.	75
Clark Equipment Co.	68
Cleveland Steel Tool Co. (The)	79
Dearborn Chemical Co.	73
Electric Arc Cutting and Welding Co.	69
Faessler (J.) Mfg. Co.	69
Falls Hollow Staybolt Co.	78
Flannery Bolt Co.	59
Forster Paint & Mfg. Co.	78
Globe Seamless Steel Tubes Co.	56
Independent Pneumatic Tool Co.	78
Keller Pneumatic Tool Co.	79
Locomotive Firebox Co.	61
Locomotive Superheater Co.	55
Logan Iron & Steel Co	52
Logansport Oxygen Co. (The)	69
MacLeod Co. (The)	77
McCabe Mfg. Co.	66
Mahr Mfg. Co.	82
National Boiler Washing Co.	71
Oxweld Railroad Service Co. (The)	67
Parkesburg Iron Co.	72
Severance (S.) Mfg. Co.	81
Talmage Mfg. Co. (The)	70
Wilson Welder & Metals Co.	80
Wood Loco. Firebox & Tube Plate Co. (Wm. H.)	76

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